

## **Design Guide**

### **Self-regulating trace heating systems for hazloc / industrial applications**



### **Design guide**

Self-regulating trace heating systems  
for pipes and tanks in hazardous locations  
with BARTEC self-regulating trace heaters



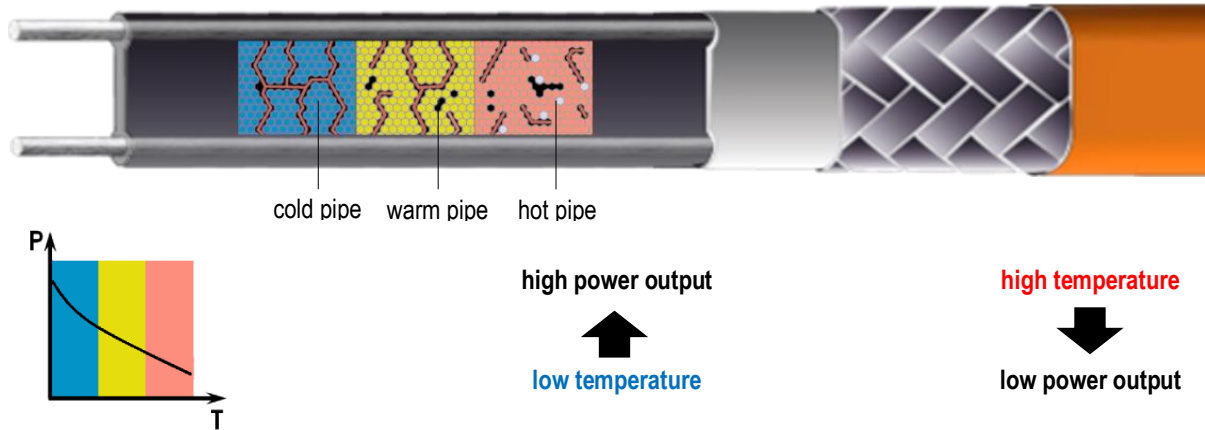
<b>Table of contents</b>	
<b>Overview</b>	<b>4</b>
Applications	5
Personnel requirements	5
Safety	5
Certifications / Approvals	5
Technical data	5
<b>System design</b>	<b>6</b>
Trace heater selection	6
Determination of the required trace heater length	15
Determination of the required number of heating circuits	16
Selection of the required components for power connection, control and monitoring, end termination etc.	18
Trace heaters	23
Power connection, splice and junction components	24
Control and monitoring units	25
Splice kits	26
End termination	26
Accessories	27
Temperature sensors	29
Spare parts	30
<b>Installation</b>	<b>31</b>
Preparation	31
Required tools / equipment	31
Unrolling the trace heater	31
Installation on pipes	31
Fastening	32
Trace heater routing	32
Installation on tanks and vessels	34
<b>Tests and commissioning</b>	<b>36</b>
Measurement of the insulation resistance	36
Acceptance test and acceptance test report	37
Commissioning	37
<b>Operation</b>	<b>37</b>
System documentation	37
<b>Maintenance</b>	<b>37</b>
Visual and functional inspection	37
Electrical inspection	37
Inspection intervals	38
Personnel training courses	38
Repairwork on piping or thermal insulation	38
<b>Troubleshooting</b>	<b>39</b>
<b>Acceptance report / Record of inspection</b>	<b>40</b>
<b>EC Declaration of conformity</b>	<b>41</b>
<b>Limited Product warranty</b>	<b>45</b>

**Overview**

This manual covers the design, installation and operation of BARTEC Self regulating trace heating systems for use in hazardous locations using the following self-regulating trace heaters:

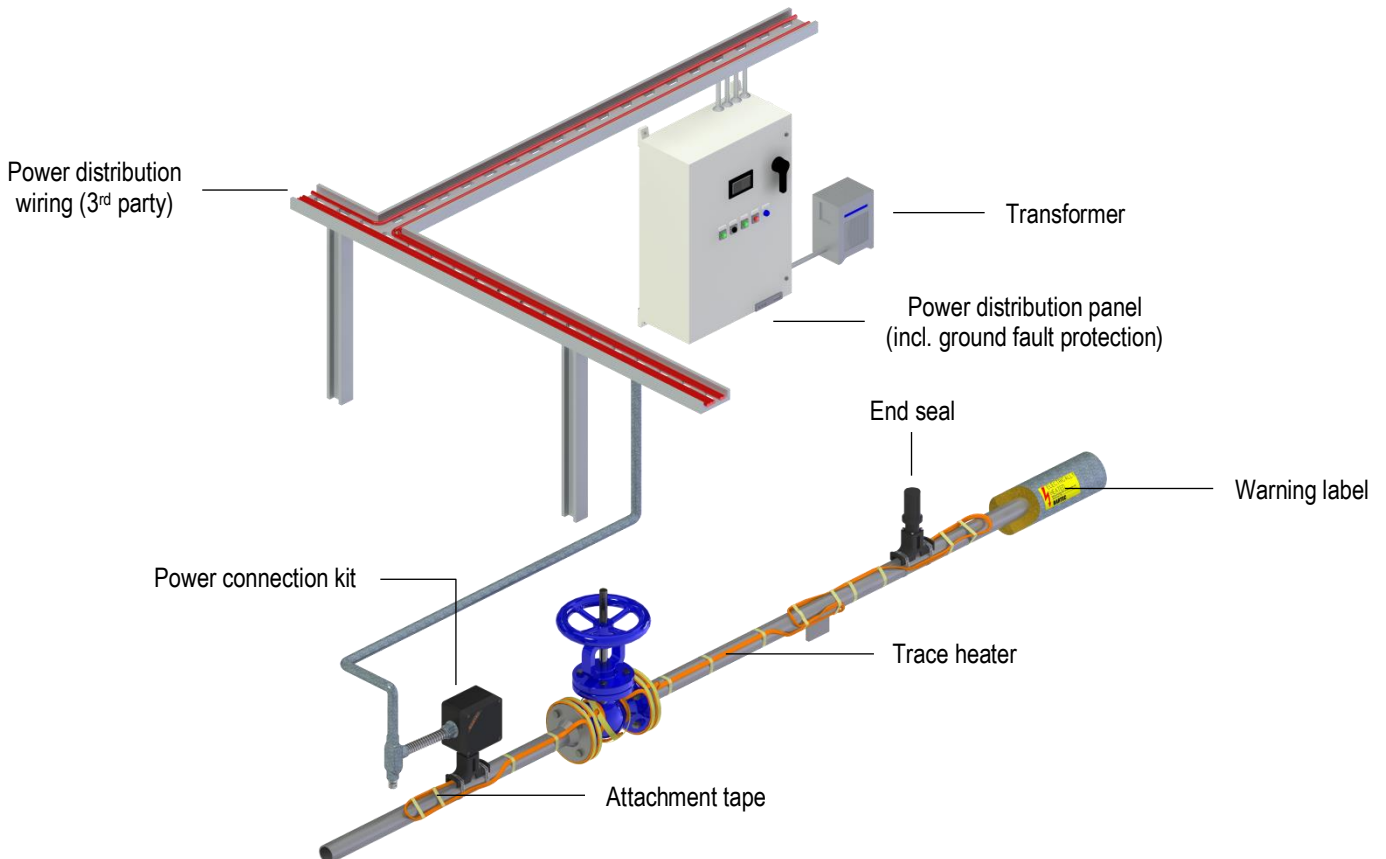
- BARTEC PSB
- BARTEC MSB
- BARTEC HSB
- BARTEC HTSB

The self-regulating trace heater features a temperature-dependent resistive element between two parallel copper conductors that regulates and limits the heat output of the trace heater according to the ambient temperature. If the ambient temperature rises, the power output of the trace heater is reduced. This self-regulating property prevents overheating which would cause damage to the trace heater. Even crossing or overlapping with other trace heaters (or other portions of the same trace heater) are possible.



The trace heaters are fixed equipment heating systems for pipes in ordinary and hazardous areas. Thanks to the parallel design the trace heater can be cut and installed to any required length (up to the maximum heating circuit length as shown on page 17).

Multiple options for connection, splicing and end termination of the heating circuit are available to meet the individual requirements on site. A large variety of accessories allows for easy customization and extensibility. The following illustration shows a typical electric trace heating system:



## Applications

Trace heating compensates for the heat loss through the thermal insulation to maintain the pipe and fluid at temperatures above the freezing or solidification point in systems that are expected to have stagnant fluids for prolonged durations.

### Freeze protection:

Water, and fluids containing significant water, expand as they freeze. This expansion can cause the pipe to be blocked or break leading to:

- Economic losses: A frozen water pipe leading to a critical process like a frozen pipe in a waste water treatment plant or cooling tower can shut down the operation causing high economic losses.
- Safety issues: A frozen pipe to safety showers can jeopardize personnel safety in the event of hazardous chemical exposure.

### Temperature maintenance:

A process temperature maintenance system can maintain the temperature of the fluid in a pipe to the desired level over a broad range of temperatures.

Maintaining liquids within the specified temperature range allows you to cost-effectively transport the fluids from one location to another, operate your processes at maximum efficiencies, and safely start/shut down your operations.

## Personnel requirements

The personnel executing installation and maintenance tasks must have acquired the skills and specialized knowledge relating to the types of protection and types of devices concerned. At least, the personnel must have:

- a general understanding of the relevant electrical engineering
- a practical understanding of the principles and techniques of explosion protection
- a working knowledge and understanding of the relevant standards of explosion protection

a basic knowledge of quality assurance, including the principles of auditing documentation, traceability of measurements and calibration of measurement instruments.

## Safety

For safe installation and operation of BARTEC Self regulating trace heating systems the technical requirements and instructions given in this manual must be followed.

### WARNING

**Risk of fire or electrical shock. Follow these guidelines to avoid personal injury or material damage.**

- All electrical systems and installations must comply with BARTEC GmbH requirements and be installed in accordance with the relevant electrical codes and any other applicable national and local codes.
- BARTEC GmbH and many international electrical and safety codes require ground fault protection to be provided for all trace heating circuits.
- Install the trace heater circuit carefully.
- Use the trace heater in accordance with the intended purpose and strictly comply with the operational data specified in section *Technical Data*.
- The bending radius of the trace heater must be at least 25 mm (for HTSB 35 mm). Do not bend on the narrow axis.
- To avoid short circuits, do not connect the trace heater bus wires together.
- Keep all components and the trace heaters dry before and during installation.
- Each heating circuit must be marked with electrical warning labels.
- Keep these instructions for future reference. If applicable, leave them with the end user.
- De-energize before installation or servicing.
- Use only original BARTEC accessories.

## Certifications / Approvals



PSB	KEMA 08 ATEX 0111 X IECEX KEM 09.0084X
HSB/MSB	KEMA 08 ATEX 0110 X IECEX KEM 09.0083X
HTSB	Sira 10 ATEX 3268 IECEX SIR 16.0035

(see BARTEC website for additional information)

## Technical data

	PSB	MSB	HSB	HTSB
<b>Max. exposure temperature</b> <i>power on</i>	65 °C	110 °C	120 °C	250 °C
<b>Max. withstand temperature</b> <i>power off</i>	85 °C	130 °C	200 °C	250 °C
<b>Min. operation temperature</b>	-40 °C	-40 °C	-60 °C	-65 °C
<b>Min. installation temperature</b>	-55 °C	-50 °C	-60 °C	-40 °C
<b>Operating voltage</b>	max. 254 Vac	max. 254 Vac	max. 254 Vac	max. 277 Vac
<b>Heat output<sup>1</sup></b>	10 to 33 W/m	10 to 40 W/m	10 to 60 W/m	15 to 75 W/m
<b>Braid resistance</b>	< 18.2 Ω/km	< 18.2 Ω/km	< 18.2 Ω/km	< 18.2 Ω/km
<b>Protection classification</b>	⊗ II 2G Ex e IIC T5, T6 Gb ⊗ II 2D Ex tb IIIC T95 °C, T 80 °C Db	⊗ II 2G Ex e IIC 150 °C (T3), T4 Gb ⊗ II 2D Ex tb IIIC T150 °C, T130 °C Db	⊗ II 2G Ex e IIC 200 °C (T2), T3, T4 Gb ⊗ II 2D Ex tb IIIC T200 °C, T195 °C, T130 °C Db	⊗ II 2G Ex e IIC T2, T3 Gb ⊗ II 2D Ex t IIIC T200 °C, T300 °C IP 6x Db
<b>Temperature classes<sup>2</sup></b>	T5, T6	T3, T4	T2, T3, T4	T2, T3
<b>Minimum bending radius</b>	25 mm	25 mm	25 mm	35 mm

<sup>1</sup> nominal heat output at 10 °C

<sup>2</sup> according to IEC/IEEE 60079-30-1:2015, refer to page 7 for further information

**System design**

For the design of trace heating systems with BARTEC self-regulating trace heaters, the following steps are necessary:

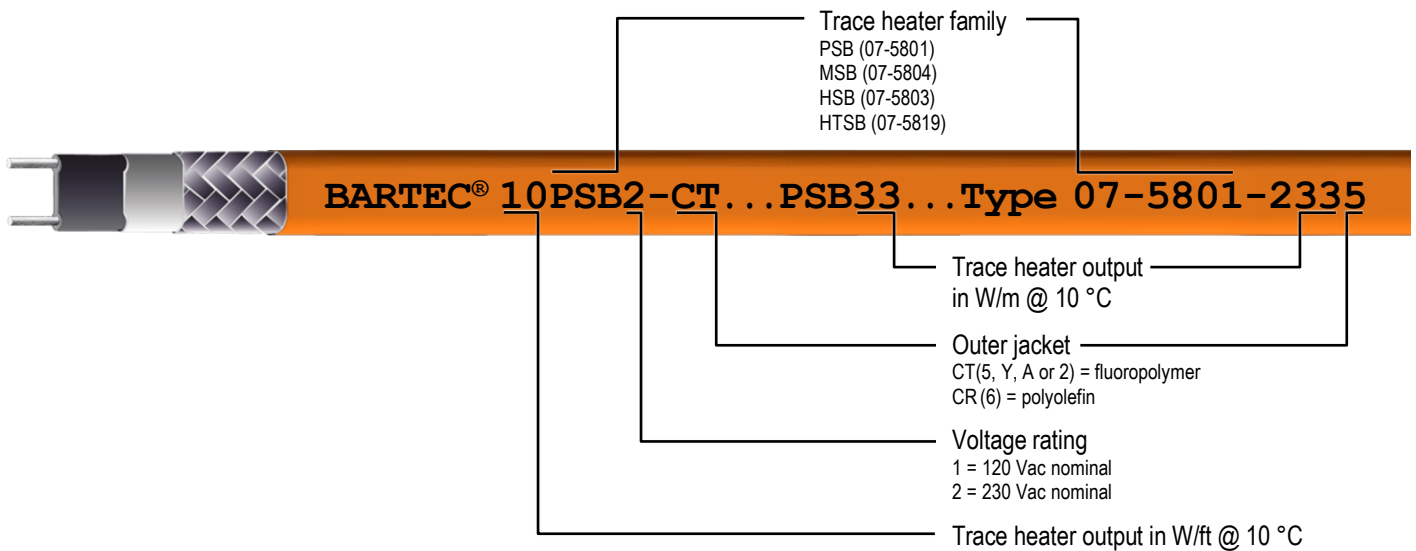
- Trace heater selection
- Determination of the total required trace heater length
- Determination of the required number of trace heating circuits
- Selection of the required components and accessories for power connection, control and monitoring, end termination etc.

The following sections provide step-by-step instructions.

**Trace heater selection**

**Step 1: Familiarize yourself with the trace heater types and their properties**

BARTEC self-regulating trace heaters are available in various types to suit different applications. Each trace heater is marked with a product code that contains relevant information as shown in the following example:



→ **Example**

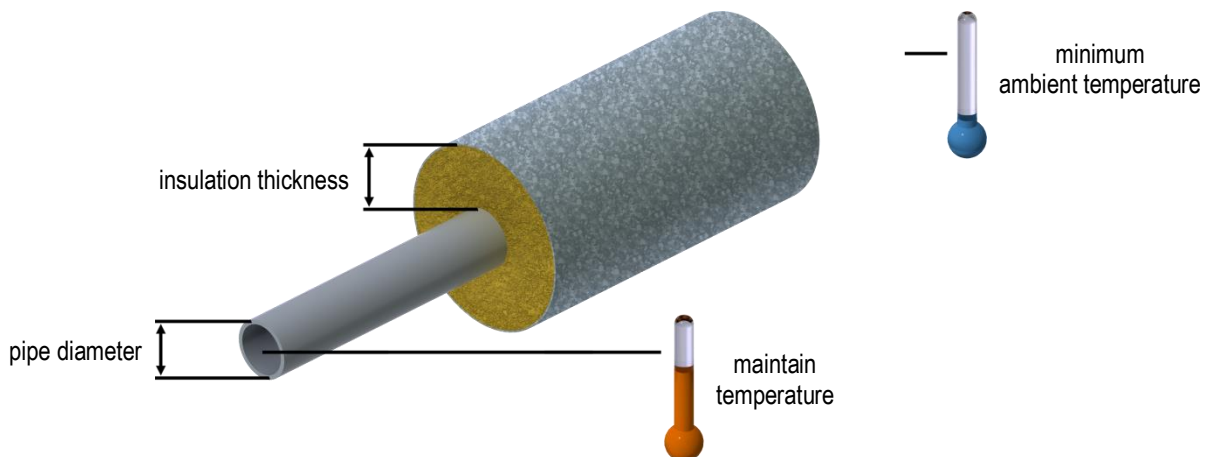
A trace heater that bears the marking **10PSB2-CT...PSB33...Type 07-5801-2335** has the following specifications:

- Trace heater output @ 10 °C: **33 W/m (10 W/ft)**
- Trace heater family: **PSB**
- Voltage rating: **230 Vac**
- Outer jacket: **fluoropolymer**

**Step 2: Determine the heat loss of your pipe setup**

For proper system design it is essential to know the effective heat loss of your pipe setup. To determine it, the following data will be required:

- Pipe diameter
- Insulation thickness
- Insulation material
- Maintain temperature
- Minimum ambient temperature
- Temperature differential  $\Delta T$ :  $\Delta T = \text{maintain temperature} - \text{minimum ambient temperature}$



Next, obtain the basic heat loss in W/m using the following table<sup>3</sup>:

		Table A: Basic heat loss in W/m																	
		Pipe ø in DN (inch)		DN8 (1¼")	DN10 (3/8")	DN15 (1/2")	DN20 (¾")	DN25 (1")	DN32 (1 1/4")	DN40 (1 1/2")	DN50 (2")	DN65 (2 1/2")	DN80 (3")	DN100 (4")	DN125 (5")	DN150 (6")	DN200 (8")	DN250 (10")	DN300 (12")
ΔT in °C																			
Insulation thickness in mm	15	25	4.3	4.9	5.7	6.7	7.8	9.3	10.3	12.4	14.9	17.2	21.4	25.7	30.4	38.9	47.9	56.4	
		35	6.2	7.2	8.2	9.7	11.4	13.5	15.0	17.9	21.6	24.9	31.0	37.2	44.1	56.4			
		45	8.2	9.5	10.9	12.8	15.1	18.0	19.9	23.8	28.7	33.1	41.2	49.4	58.6				
		75	15.0	17.4	20.0	23.5	27.6	32.8	36.4	43.5	52.4								
		100	21.5	24.9	28.6	33.6	39.5	47.0	52.1										
		125	28.7	33.3	38.2	44.9	52.8												
	20	25	3.6	4.2	4.7	5.5	6.4	7.5	8.3	9.8	11.7	13.4	16.6	19.8	23.4	29.8	36.5	42.9	
		35	5.3	6.0	6.8	7.9	9.2	10.9	12.0	14.2	17.0	19.5	24.1	28.7	33.9	43.1	52.9		
		45	7.0	8.0	9.1	10.5	12.3	14.5	15.9	18.9	22.6	25.9	32.0	38.2	45.1	57.3			
		75	12.8	14.6	16.6	19.3	22.5	26.4	29.1	34.5	41.2	47.3	58.6						
		100	18.3	20.9	23.8	27.6	32.2	37.9	41.7	49.4	59.0								
		125	24.4	28.0	31.8	36.9	42.9	50.6	55.7										
	25	25	3.2	3.7	4.1	4.8	5.5	6.4	7.0	8.3	9.8	11.2	13.8	16.3	19.2	24.3	29.7	34.8	
		35	4.7	5.3	6.0	6.9	8.0	9.3	10.2	12.0	14.2	16.2	19.9	23.6	27.8	35.2	43.0	50.4	
		45	6.2	7.1	8.0	9.1	10.6	12.3	13.5	15.9	18.9	21.5	26.5	31.4	36.9	46.8	57.1		
		75	11.3	12.9	14.5	16.7	19.3	22.6	24.7	29.1	34.5	39.4	48.4	57.4					
		100	16.2	18.5	20.8	24.0	27.7	32.3	35.4	41.7	49.4	56.4							
		125	21.7	24.7	27.8	32.0	36.9	43.1	47.3	55.7									
	30	25	2.9	3.3	3.7	4.3	4.9	5.7	6.2	7.2	8.5	9.7	11.8	14.0	16.4	20.6	25.1	29.4	
		35	4.3	4.8	5.4	6.2	7.1	8.2	9.0	10.5	12.3	14.0	17.1	20.2	23.7	29.9	36.4	42.6	
		45	5.7	6.4	7.2	8.2	9.4	10.9	11.9	13.9	16.4	18.6	22.8	26.9	31.5	39.7	48.4	56.5	
		75	10.4	11.7	13.1	15.0	17.2	19.9	21.8	25.4	30.0	34.1	41.6	49.2	57.6				
		100	14.8	16.8	18.8	21.5	24.6	28.5	31.2	36.4	42.9	48.8	59.6						
		125	19.8	22.4	25.1	28.7	32.9	38.1	41.6	48.7	57.3								
40	25	2.6	2.9	3.2	3.6	4.1	4.7	5.1	5.9	6.9	7.8	9.4	11.0	12.8	16.0	19.4	22.6		
	35	3.7	4.2	4.6	5.2	5.9	6.8	7.4	8.6	10.0	11.3	13.6	16.0	18.6	23.2	28.1	32.8		
	45	5.0	5.5	6.2	7.0	7.9	9.1	9.8	11.4	13.3	15.0	18.1	21.2	24.7	30.9	37.4	43.5		
	75	9.1	10.1	11.3	12.7	14.5	16.6	18.0	20.8	24.3	27.4	33.1	38.8	45.2	56.5				
	100	13.0	14.5	16.1	18.2	20.7	23.7	25.8	29.8	34.8	39.2	47.4	55.6						
	125	17.4	19.4	21.6	24.4	27.6	31.7	34.4	39.8	46.4	52.4								
50	25	2.3	2.6	2.9	3.2	3.6	4.1	4.5	5.1	5.9	6.6	7.9	9.2	10.7	13.3	16.0	18.6		
	35	3.4	3.8	4.2	4.7	5.2	6.0	6.4	7.4	8.6	9.6	11.5	13.4	15.5	19.2	23.2	26.9		
	45	4.5	5.0	5.5	6.2	7.0	7.9	8.6	9.8	11.4	12.8	15.3	17.8	20.6	25.6	30.8	35.7		
	75	8.3	9.2	10.1	11.3	12.8	14.5	15.7	18.0	20.8	23.3	28.0	32.5	37.7	46.7	56.3			
	100	11.8	13.1	14.5	16.2	18.3	20.8	22.4	25.7	29.8	33.4	40.0	46.6	53.9					
	125	15.8	17.5	19.3	21.7	24.4	27.7	30.0	34.4	39.8	44.6	53.5							
100	25	1.8	2.0	2.1	2.3	2.6	2.9	3.1	3.4	3.9	4.2	4.9	5.6	6.4	7.7	9.1	10.38		
	35	2.6	2.9	3.1	3.4	3.7	4.1	4.4	4.9	5.6	6.1	7.2	8.1	9.2	11.2	13.2	15.0		
	45	3.5	3.8	4.1	4.5	5.0	5.5	5.9	6.6	7.4	8.2	9.5	10.8	12.3	14.8	17.5	20.0		
	75	6.4	6.9	7.5	8.2	9.1	10.1	10.7	12.0	13.6	14.9	17.4	19.8	22.4	27.1	32.0	36.5		
	100	9.1	9.9	10.7	11.8	13.0	14.4	15.4	17.2	19.4	21.3	24.9	28.3	32.1	38.8	45.8	52.3		
	125	12.2	13.3	14.4	15.8	17.4	19.3	20.5	23.0	25.9	28.5	33.2	37.8	42.9	51.8	61.1	69.9		

<sup>3</sup> Heat loss calculations are based on IEC/IEEE 60079-30-1:2015 Annex C and IEC/IEEE 60079-30-2:2015 Annex E. The following assumptions have been made:

- Medium not in motion
- Single layer insulation
- No gap between pipe and insulation layer
- No gap between insulation layer and weather shielding
- Ambient temperature: -20 °C
- Outdoor installation, wind speed: 20 m/s
- Application of a safety factor of +10 %

For other values contact your local BARTEC distributor.

Finally, you must apply the following correction factors depending on your insulation material:

		Table B: Insulation Correction Factors	
		Correction Factor	thermal conductivity at 20 °C in W/m·K
Insulation material	Rockwool / Mineral Fibre (ASTM C547-15 Type II)	1.00	0.0370
	Calcium Silicate (ASTM C547-13 Type I)	1.72	0.0567
	Cellular glass (ASTM C552-15 Type II)	1.46	0.0481
	Rigid cellular urethane (ASTM C591-13 Type I)	0.83	0.0275
	Foamed elastomer Grade 2 (ASTM C534-14)	1.29	0.0425
	Expanded perlite (ASTM C610-15)	2.06	0.0678
	Pyrogel XT (ASTM C1728-12)	0.56	0.0206

→ Example

- Pipe diameter: **DN25**
  - Insulation thickness: **20 mm**
  - Insulation material: **calcium silicate**
  - Minimum ambient temperature: **-20 °C**
  - Maintain temperature: **25 °C**
- }  $\Delta T = 25\text{ °C} - (-20\text{ °C}) = 45\text{ °C}$

We obtain the basic heat loss in W/m from Table A on page 7:

		TABLE A: Basic heat loss in W/m						
		Pipe ø in DN (inch)	DN8 (1/4")	DN10 (3/8")	DN15 (1/2")	DN20 (3/4")	DN25 (1")	DN32 (1 1/4")
		ΔT in °C						
Insulation thickness in mm	15	25	4.3	4.9	5.7	6.7	7.8	9.3
		35	6.2	7.2	8.2	9.7	11.4	13.5
		45	8.2	9.5	10.9	12.8	15.1	18.0
		75	15.0	17.4	20.0	23.5	27.6	32.8
		100	21.5	24.9	28.6	33.6	39.5	47.0
	125	28.7	33.3	38.2	44.9	52.8		
	20	25	3.6	4.2	4.7	5.5	6.4	7.5
		35	5.3	6.0	6.8	7.9	9.2	10.9
		45	7.0	8.0	9.1	10.5	12.3	14.5
		75	12.8	14.6	16.6	19.3	22.5	26.4
100		18.3	20.9	23.8	27.6	32.2	37.9	

basic heat loss: **12.3 W/m**

Now, the correction factors from Table B must be checked and, if necessary, applied:

		Table B: Insulation Correction Factors
		Correction Factor*
Insulation material	Rockwool / Mineral Fibre (ASTM C547-15 Type II)	1.00
	Calcium Silicate (ASTM C547-13 Type I)	1.72
	Cellular glass (ASTM C552-15 Type II)	1.46
	Rigid cellular urethane (ASTM C591-13 Type I)	0.83
	Foamed elastomer Grade 2 (ASTM C534-14)	1.29

correction factor insulation: **1.72**

The effective heat loss of the setup is determined as follows:

effective heat loss = basic heat loss × correction factor insulation  
 = 12.3 W/m × 1.72  
 = **21.2 W/m**



### Step 3: Choose a trace heater family

Determine the requirements for your trace heating application:

- Maximum exposure temperature (power on / power off)
- Minimum operation / installation temperature
- Required heat output to compensate for the effective heat loss as calculated in Step 2
- Required temperature class ("T-Rating")

Select the trace heater family that meets your requirements using the following table:

		<b>Table C: Trace heater family selection</b>			
		<b>PSB</b>	<b>MSB</b>	<b>HSB</b>	<b>HTSB</b>
<b>Maximum exposure temperature</b> <i>power on</i>		65 °C	110 °C	120 °C	250 °C
<b>Maximum withstand temperature</b> <i>power off</i>		85 °C	130 °C	200 °C	250 °C
<b>Minimum operation temperature</b>		-40 °C	-40 °C	-60 °C	-65 °C
<b>Minimum installation temperature</b>		-55 °C	-50 °C	-60 °C	-40 °C
<b>Power output<sup>4</sup></b>		10, 15, 26, 33 W/m	10, 15, 30, 40 W/m	10, 15, 30, 45, 60 W/m	15, 30, 45, 60, 75 W/m
<b>Supply voltage</b>		110 to 120 Vac / 208 to 254 Vac	208 to 254 Vac	110 to 120 Vac / 208 to 254 Vac	110 to 120 Vac / 208 to 277 Vac
<b>Braid resistance / Minimum percent coverage</b>		< 18.2 Ω/km / > 70 %	< 18.2 Ω/km / > 70 %	< 18.2 Ω/km / > 70 %	< 18.2 Ω/km / > 70 %
<b>Braid material</b>		Tinned copper	Nickel-plated copper	Nickel-plated copper	Nickel-plated copper
<b>Minimum bending radius</b>		25 mm (Do not bend on the narrow axis.)	25 mm (Do not bend on the narrow axis.)	25 mm (Do not bend on the narrow axis.)	35 mm (Do not bend on the narrow axis.)
<b>Cable weight</b>		10.9 kg/100 m	12.5 kg/100 m	12.5 kg/100 m	14.6 kg/100 m
<b>Heater dimensions</b>	<i>fluoropolymer outer jacket</i>	11.6 x 5.6 mm	10.2 x 4.8 mm	10.2 x 4.8 mm	12.1 x 5.4 mm
	<i>polyolefin outer jacket</i>	11.8 x 5.8 mm	n/a	n/a	n/a
<b>Temperature classes<sup>5</sup></b>		10, 15 W/m → T6 26, 33 W/m → T5	10, 15, 25 W/m → T4 30, 40 W/m → 150 °C (T3)	15, 30, 45 W/m → T3 60 W/m → 200 °C (T2)	15, 30, 45, 60 W/m → T3 75 W/m → T2
<b>Protection classification</b>		Ⓔ II 2G Ex e IIC T5, T6 Gb Ⓔ II 2D Ex tb IIIC T95°C, T 80°C Db	Ⓔ II 2G Ex e IIC 150°C (T3), T4 Gb Ⓔ II 2D Ex tb IIIC T150°C, T130°C Db	Ⓔ II 2G Ex e IIC 200°C (T2), T3, T4 Gb Ⓔ II 2D Ex tb IIIC T200°C, T195°C, T130°C Db	Ⓔ II 2G Ex e IIC, T2, T3 Gb Ⓔ II 2D Ex t IIIC T200°C, T300°C, IP 6x Db

## NOTICE

If you want to use plastic piping within your installation, contact your local BARTEC distributor for verification that the design does not exceed the maximum withstand temperature of the pipe material. Also, adjustments in heat loss calculations may be required.

### → Example

- Maximum exposure temperature: **50 °C** ("power on"), **70 °C** ("power off")
- Minimum operation temperature: **-10 °C**
- Required heat output: **21.2 W/m**
- Required temperature class: **T5**

Trace heater family that meets the requirements: **PSB**

<sup>4</sup> nominal heat output at 10 °C

<sup>5</sup> applies for the trace heater models with 230 Vac nominal rated voltage, temperature classes according to IEC/IEEE 60079-30-1:2015 (max. surface temperature). For other voltages or temperatures contact your local BARTEC distributor.

**Step 4: Determine the required power rating**

Since the power output of self-regulating trace heaters depends on the pipe temperature, the conditions within your application must be considered when choosing the trace heater:

- Determine the maintain temperature (= pipe temperature) of your application and the effective heat loss as calculated in Step 2.
- Find the required power output in the graph that contains the trace heater type and voltage you use (see tables on pages 11 to 13).
- If the required power output is between 2 trace heater types, choose the one with the higher rating.
- If the required power output exceeds the output of the trace heater with the highest rating, you may:
  - Use 2 or more trace heaters on the same pipe.
  - Use a thicker insulation or insulation material with a lower thermal conductivity.
  - Contact your local BARTEC distributor for further assistance.

→ **Example**

- Trace heater family as determined in Step 3: **PSB**
- Power supply voltage: **230 V**
- Maintain temperature: **25 °C**
- Effective heat loss: **21.2 W/m**

Trace heater that meets the required power output: **10PSB / PSB33**

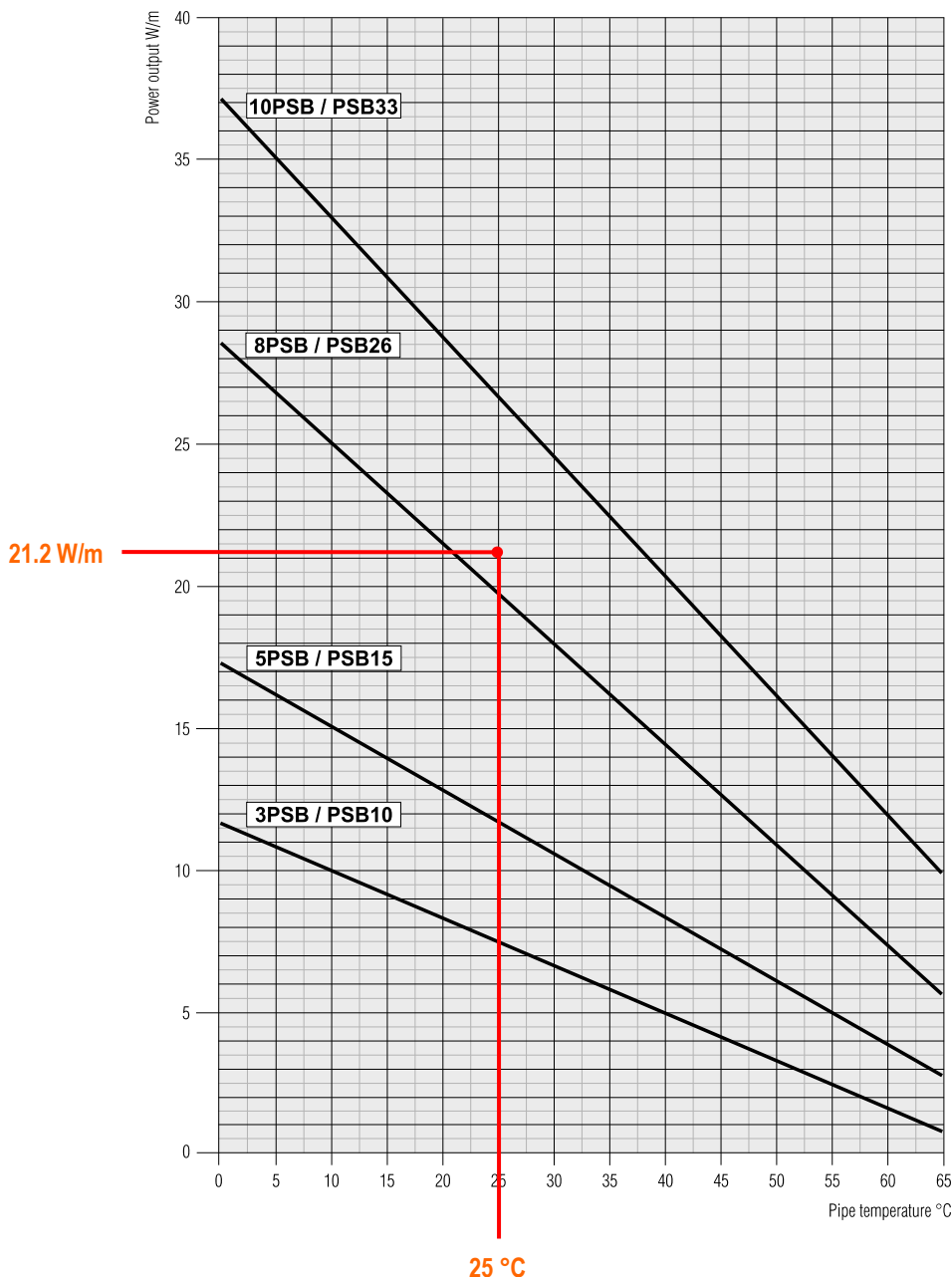
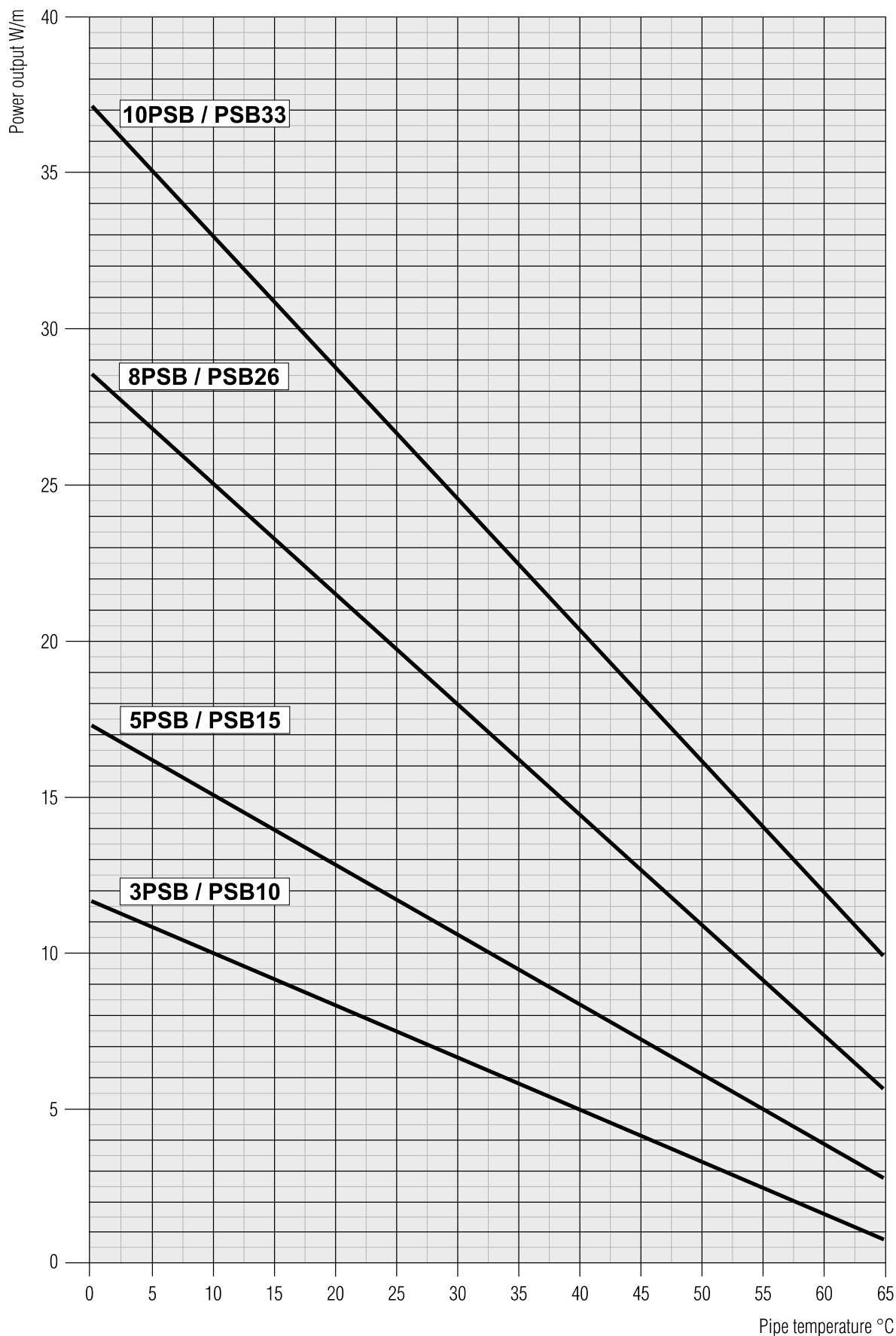
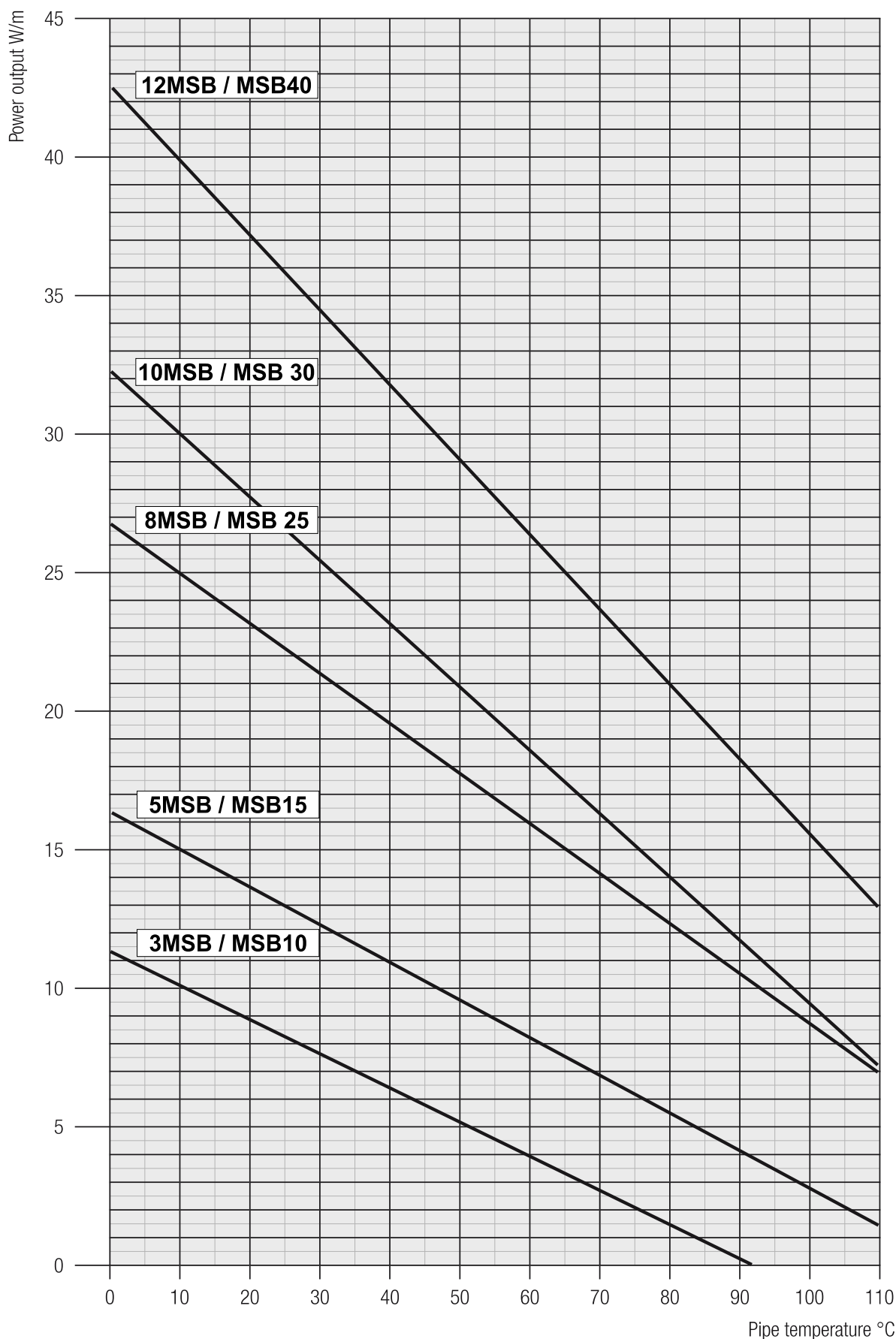


Table D: PSB 230 V



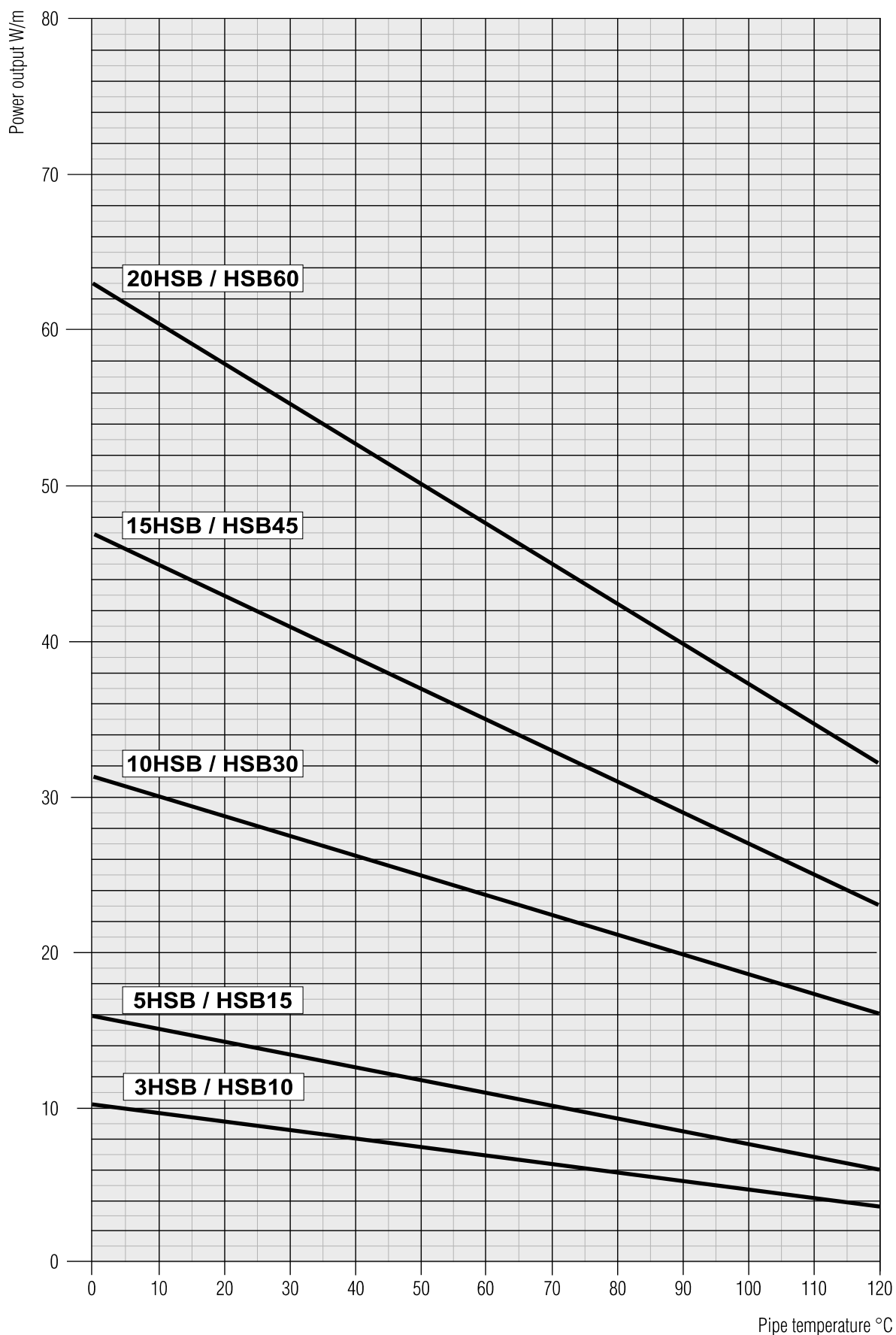
For MSB trace heaters see page 12.  
 For HSB trace heaters see page 13.  
 For HTSB trace heaters see page 14.

Table E: MSB 230 V



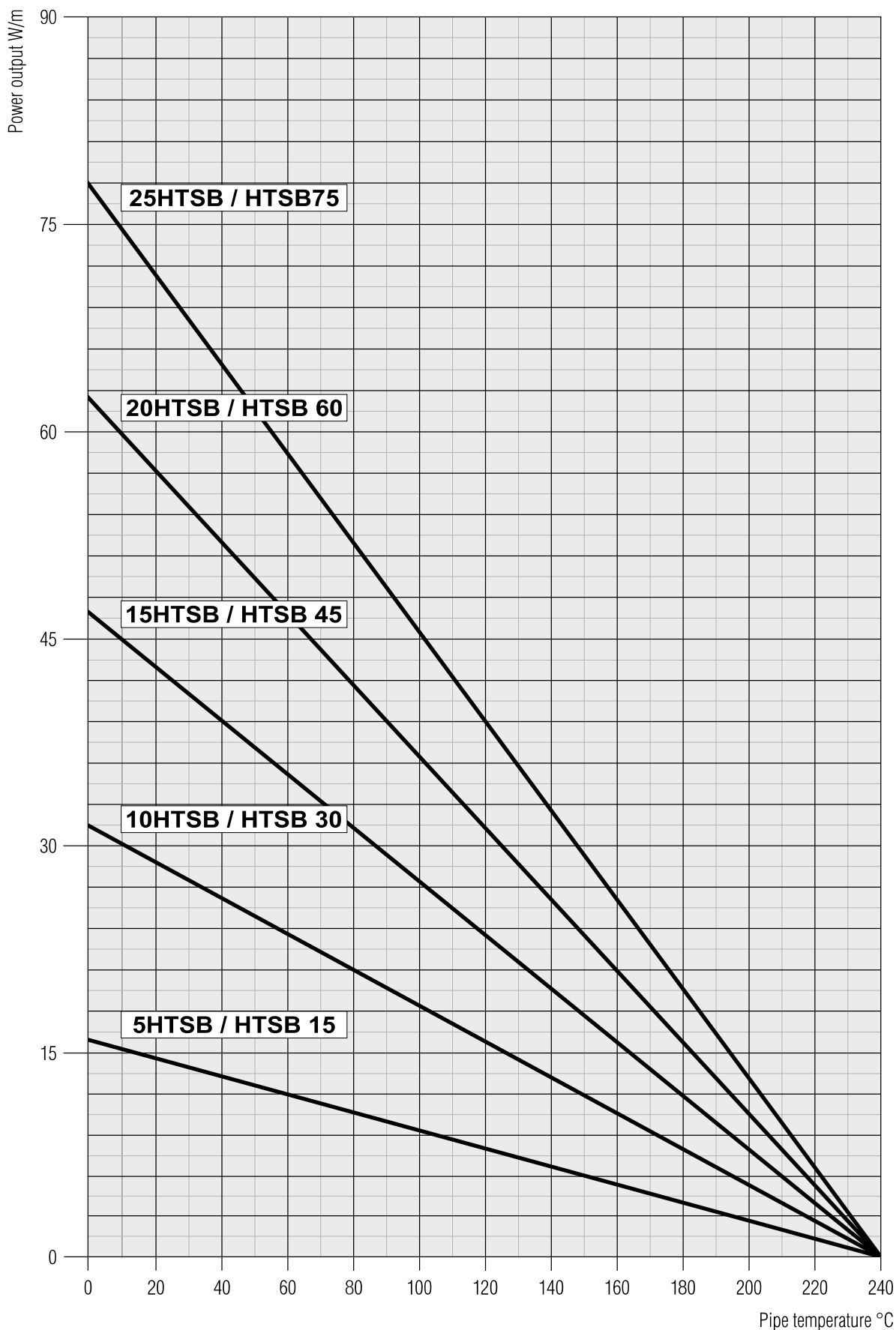
For PSB trace heaters see page 11.  
 For HSB trace heaters see page 13.  
 For HTSB trace heaters see page 14.

**Table F: HSB 230 V**



**For PSB trace heaters see page 11.  
 For MSB trace heaters see page 12.  
 For HTSB trace heaters see page 14.**

Table G: HTSB 230 V



For PSB trace heaters see page 11.  
 For MSB trace heaters see page 12.  
 For HSB trace heaters see page 13.

## Step 5: Select the appropriate outer jacket material

BARTEC self-regulating trace heaters are available with 2 different types of outer jackets. Choose the outer jacket that suits the chemical environment it will be exposed to. For questions regarding the chemical resistance please contact your local BARTEC distributor.

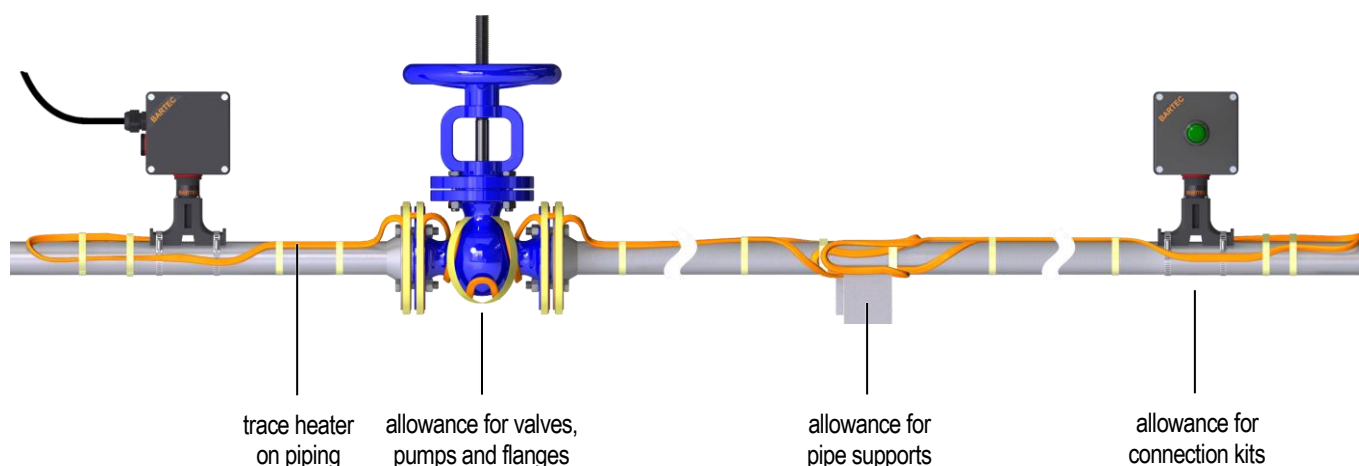
Table H: Chemical resistance of outer jackets			
	Application	Catalog No.	Type key (example)
Polyolefin outer jacket	exposure to aqueous, inorganic chemicals	...-CR	07-5801-2336 (PSB only)
Fluoropolymer outer jacket	exposure to organic chemicals	...-CT	07-5801-2335 (PSB) 07-5804-225Y (MSB) 07-5803-230A (HSB) 07-5819-7452 (HTSB)

### → Example

- Trace heating systems for process applications in the oil industry: **fluoropolymer outer jacket**
- Trace heater catalog no. that meets the required power output and environmental conditions: **10PSB2-CT, Type 07-5801-2335**

## Determination of the required trace heater length

The total required trace heater length is determined by taking into account the trace heater length for piping as well as allowances for valves, pumps, flanges, pipe supports and connection kits.



## Step 6: Determine the required trace heater length for the piping:

The required trace heater length for piping corresponds to the pipe length.

### → Example

50 m of piping = 50 m of trace heater

## Step 7: Determine the required allowance for connection kits:

The required trace allowance for connection kits is 0.5 m for each kit.

### → Example

- Heating circuit with 1 power connection kit and 1 end of line lamp

The total required allowance is calculated as follows:

$$\begin{aligned}
 \text{total required allowance} &= \text{no. of connection kits} \times 0.5 \text{ m} \\
 &= 2 \times 0.5 \text{ m} \\
 &= \underline{1.0 \text{ m}}
 \end{aligned}$$

**Step 8: Determine the required allowance for pumps, valves, flanges and pipe supports:**

Determine the required allowances for pumps, valves, flanges and pipe supports using the following table:

Pipe diameter in DN / inch	Table 1: Allowance values and pipe support intervals													
	DN8 1/4"	DN15 1/2"	DN20 3/4"	DN25 1"	DN32 1 1/4"	DN40 1 1/2"	DN50 2"	DN65 2 1/2"	DN80 3"	DN100 4"	DN150 6"	DN200 8"	DN250 10"	DN300 12"
Allowance for pumps in m	1.5	2	2	2.1	2.3	2.3	2.4	2.4	2.4	2.6	3	3.5	4	4
Allowance for valves in m	0.5	0.5	0.5	0.6	0.6	0.7	0.7	1	1	1.3	1.5	1.6	1.8	2
Allowance for flanges in m	0.2	0.2	0.3	0.3	0.3	0.3	0.4	0.4	0.5	0.7	0.9	1	1.2	1.2
Allowance for pipe supports in m	0.2	0.2	0.3	0.3	0.3	0.3	0.4	0.4	0.5	0.7	0.9	1	1.2	1.2
Typical pipe support interval in m	1	1.5	1.5	2	2	2.5	3.1	4	4	5	6	7	8	8

→ **Example**

- Pipe diameter: DN25
- 1 pump
- 2 valves
- 6 flanges
- 24 pipe supports

The total required allowance is calculated as follows:

$$\begin{aligned}
 \text{total required allowance} &= \text{no. of pumps} \times \text{pump allowance value} + \\
 &\quad \text{no. of valves} \times \text{valve allowance value} + \\
 &\quad \text{no. of flanges} \times \text{flange allowance value} + \\
 &\quad \text{no. of pipe supports} \times \text{pipe support allowance value} \\
 &= 1 \times 2.1 \text{ m} + 2 \times 0.6 \text{ m} + 6 \times 0.3 \text{ m} + 24 \times 0.3 \text{ m} \\
 &= \underline{12.3 \text{ m}}
 \end{aligned}$$

**Step 9: Add all lengths / allowances together:**

Add the lengths for piping (as determined in step 6) and allowances (as determined in step 7 and step 8) together to obtain total required trace heater length.

→ **Example**

- required trace heater length for piping (step 6): 50 m
- required allowances for connection kits (step 7): 1.0 m
- required allowances for pumps, valves, flanges and pipe supports (step 8): 12.3 m

$$\begin{aligned}
 \text{total required trace heater length} &= \text{required trace heater length for piping} + \text{required allowances} \\
 &= 50 \text{ m} + 1.0 \text{ m} + 12.3 \text{ m} \\
 &= \underline{63.3 \text{ m}}
 \end{aligned}$$

**Determination of the required number of heating circuits**

**Step 10: Confirm the number of electrical circuits required for the application:**

Using Table J on page 17, compare the required heater length and start up temperature to the available circuit breaker allowances to determine the number of electrical circuits that will be required.

→ **Example**

- total required trace heater length: 63.3 m
- circuit breaker voltage: 230 Vac
- selected trace heater: 10 PSB
- circuit breaker amperage: 20 A
- required start-up temperature: -15 °C

Circuit breaker size	Start-up temperature	PSB trace heaters		
		Operating voltage: 230 Vac		
		5 PSB / PSB 15	8 PSB / PSB 26	10 PSB / PSB 33
16 A	+10 °C	145 m	88 m	71 m
	-15 °C	93 m	58 m	49 m
	-30 °C	77 m	45 m	41 m
20 A	+10 °C	162 m	117 m	98 m
	-15 °C	125 m	76 m	64 m
	-30 °C	106 m	64 m	52 m
25 A	+10 °C	162 m	120 m	98 m
	-15 °C	142 m	95 m	82 m

$$\begin{aligned}
 \text{allowable trace heater length from table below} &= \text{maximum of 64 m at -15 °C on 20 A circuit breaker at 230 Vac} \\
 &= 63.3 \text{ m calculated} < 64 \text{ m maximum allowable for 20 A} \\
 &= \underline{1 \text{ circuit}}
 \end{aligned}$$



The following table shows the maximum circuit length for one continuous length of cable, not the sum of segments of cable. If feeding multiple cable segments from the single circuit breaker, please refer to BARTEC HELOC design software or contact BARTEC technical support. Breaker sizing should be based on international electric codes or any other local or applicable code. Use only circuit breakers with type C tripping characteristics.

## WARNING

Risk of fire, electrical shock or dysfunction. Observe the maximum amperage of all components of the trace heating circuit. If the required trace heater length exceeds the maximum heating circuit length you must install multiple heating circuits.

*Table J: Maximum heating circuit length for circuit breakers with Type C tripping characteristics*

Circuit breaker size	Start-up temperature	PSB trace heaters			
		Operating voltage: 230 Vac			
		3 PSB / PSB 10	5 PSB / PSB 15	8 PSB / PSB 26	10 PSB / PSB 33
16 A	+10 °C	205 m	145 m	88 m	70 m
	-15 °C	139 m	93 m	58 m	49 m
	-30 °C	120 m	77 m	45 m	43 m
20 A	+10 °C	205 m	162 m	117 m	90 m
	-15 °C	186 m	125 m	75 m	64 m
	-30 °C	150 m	106 m	64 m	52 m
25 A	+10 °C	205 m	162 m	120 m	98 m
	-15 °C	190 m	142 m	95 m	80 m
	-30 °C	170 m	135 m	82 m	65 m
32 A	+10 °C	205 m	162 m	126 m	108 m
	-15 °C	195 m	160 m	117 m	95 m
	-30 °C	195 m	160 m	100 m	82 m

Circuit breaker size	Start-up temperature	MSB trace heaters				
		Operating voltage: 230 Vac				
		3 MSB / MSB 10	5 MSB / MSB 15	8 MSB / MSB 25	10 MSB / MSB 30	12 MSB / MSB 40
16 A	+10 °C	200 m	165 m	120 m	85 m	70 m
	-25 °C	175 m	117 m	88 m	69 m	49 m
	-50 °C	165 m	110 m	80 m	65 m	45 m
20 A	+10 °C	235 m	189 m	140 m	114 m	82 m
	-25 °C	235 m	152 m	120 m	92 m	66 m
	-50 °C	225 m	144 m	114 m	86 m	62 m
32 A	+10 °C	235 m	189 m	140 m	114 m	82 m
	-25 °C	235 m	189 m	140 m	114 m	82 m
	-50 °C	235 m	189 m	136 m	110 m	78 m

Circuit breaker size	Start-up temperature	HSB trace heaters				
		Operating voltage: 230 Vac				
		3 HSB / HSB 10	5 HSB / HSB 15	10 HSB / HSB 30	15 HSB / HSB 45	20 HSB / HSB 60
16 A	+10 °C	200 m	165 m	85 m	70 m	50 m
	-25 °C	175 m	117 m	69 m	49 m	38 m
	-60 °C	165 m	110 m	65 m	45 m	35 m
20 A	+10 °C	235 m	189 m	114 m	82 m	64 m
	-25 °C	235 m	152 m	92 m	66 m	52 m
	-60 °C	225 m	144 m	86 m	62 m	48 m
25 A	+10 °C	235 m	189 m	114 m	82 m	64 m
	-25 °C	235 m	170 m	100 m	75 m	58 m
	-60 °C	230 m	160 m	92 m	70 m	52 m
32 A	+10 °C	235 m	189 m	114 m	82 m	64 m
	-25 °C	235 m	189 m	114 m	82 m	64 m
	-60 °C	235 m	189 m	110 m	78 m	60 m

Circuit breaker size	Start-up temperature	HTSB trace heaters				
		Operating voltage: 230 Vac				
		5 HTSB / HTSB 15	10 HTSB / HTSB 30	15 HTSB / HTSB 45	20 HTSB / HTSB 60	25 HTSB / HTSB 75
16 A	+10 °C	126 m	82 m	62 m	50 m	42 m
	0 °C	120 m	78 m	58 m	46 m	40 m
	-20 °C	108 m	70 m	52 m	42 m	36 m
20 A	+10 °C	154 m	102 m	78 m	62 m	52 m
	0 °C	150 m	96 m	74 m	58 m	48 m
	-20 °C	136 m	88 m	66 m	52 m	44 m
25 A	+10 °C	154 m	108 m	88 m	76 m	64 m
	0 °C	154 m	108 m	88 m	72 m	60 m
	-20 °C	154 m	108 m	82 m	66 m	54 m
32 A	+10 °C	172 m	108 m	88 m	76 m	82 m
	0 °C	172 m	108 m	88 m	76 m	78 m
	-20 °C	172 m	108 m	88 m	76 m	70 m

**Selection of the required components for power connection, control and monitoring, end termination etc.**

A typical heating circuit with self-regulating trace heaters consists of:

- Power supply / cold lead cable connection
- Trace heater splices / junctions (optional)
- Control and monitoring units (optional)
- End termination

**Step 11: Determine the required trace heater power connection kit:**

→ **Example**

- From Step 10: 1 Heating circuit with 1 power connection kit = **PBS-200-E**

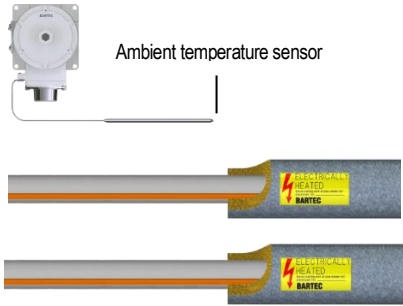
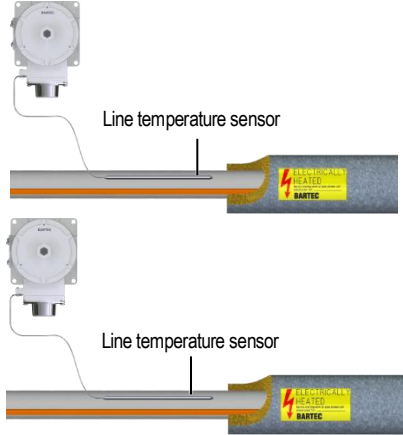
**Step 12: Determine if control equipment is required:**

BARTEC provides a variety of control products, from simple mechanical thermostats to sophisticated digital controllers and control and monitoring systems designed specifically for use with our trace heating products. This section will help you select and specify the right control products for your application.

**General design considerations for temperature control:**



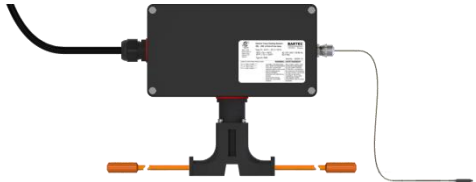


When designing your trace heating system, you should consider the following factors.

- Adding control elements increases the installation and maintenance costs of the heating system, but allows tighter temperature control, energy savings and more efficient use of plant maintenance personnel's time.
- The thermal environment of a trace heating system varies greatly, especially at valves, pipe supports, and other heat sinks. It is therefore seldom possible to achieve very tight temperature control.
- The temperature of a heat tracing system is based on ambient temperature and can vary by as much as 20 °C when the system is uncontrolled. You can choose between 2 approaches for temperature control:

<p><b>Ambient sensing control</b></p>	 <p>Ambient temperature sensor</p>	<p>Ambient sensing control:</p> <ul style="list-style-type: none"> <li>▪ uses an on-off thermostat that senses ambient temperature</li> <li>▪ is more energy efficient than self-regulating control because the heating circuit is energized only when the temperature drops below the set-point</li> <li>▪ is most suitable for freeze-protection applications where multiple circuits can be controlled by a single sensing point</li> <li>▪ flow path considerations (flowing or non-flowing) are not required with ambient control.</li> </ul>
<p><b>Line sensing control</b></p>	 <p>Line temperature sensor</p> <p>Line temperature sensor</p>	<p>Line sensing control:</p> <ul style="list-style-type: none"> <li>▪ regulates the desired maintain temperature by turning the heating circuit on if the pipe temperature falls below the set-point and turning it off if it exceeds the set-point</li> <li>▪ the most energy-efficient method for controlling heat tracing is a line-sensing thermostat, because a flowing pipe will typically not need any additional heat to keep it at the proper temperature</li> <li>▪ needs a separate circuit controlled by a line-sensing thermostat for each flow path</li> <li>▪ where a piping system has tees and therefore multiple flow paths, more than one thermostat may be required.</li> </ul>

**NOTICE**  
 Line sensing provides tighter temperature control than ambient sensing but flow paths may require additional controllers.

## Overview of control equipment:

Mechanical thermostats		<b>DTW</b> <ul style="list-style-type: none"> <li>Fixed set point mechanical thermostat with a 5 °C set point</li> <li>IP65 in coated cast aluminium enclosure</li> <li>SPDT switch rated 480 Vac, 22 A</li> </ul>
		<b>BSTW II</b> <ul style="list-style-type: none"> <li>Adjustable set point mechanical thermostat with -20 °C to 50 °C or 0 °C to 190 °C range</li> <li>IP65 rating in a GRP enclosure suitable for mounting off of the pipe</li> <li>SPDT switch, load path rated 400 Vac, 16 A / 230 Vac, 25 A</li> </ul>
		<b>PBTW-200-E</b> <ul style="list-style-type: none"> <li>Adjustable set point mechanical thermostat with -20 °C to 50 °C or 0 °C to 190 °C range</li> <li>IP 65 rating in a GRP enclosure suitable for mounting on pipe</li> <li>SPDT switch, load path rated 230 Vac, 25 A</li> </ul>
Electronic controllers		<b>DETU-300-CN</b> <ul style="list-style-type: none"> <li>Adjustable set point electronic thermostat with a -4 °C to 600 °C range</li> <li>IP 65 rating in a GRP enclosure suitable for mounting off of the pipe or on adjacent structure</li> <li>RS485 communications interface, Modbus RTU</li> <li>SPDT switch rating 230 Vac, 22 A/25 A/30 A @ 55 °C/50 °C/40 °C</li> </ul>
		<b>ESTM-30</b> <ul style="list-style-type: none"> <li>Continuous monitoring technology for heat-tracing faults</li> <li>Internal diagnostics and monitoring of the heat tracing current</li> <li>Integral ground fault monitoring</li> <li>DPDT switch rated 30 A</li> <li>RS485 communications interface, Modbus RTU</li> <li>Bluetooth communication</li> </ul>

## Recommendations for selecting the appropriate control equipment:

Base your selection on the number and type of trace heating circuits to be installed, the type of control you need, and the area classification.

TABLE K: Control Equipment Selection Recommendations				
Heating circuit type	Application	Control options	Suitable BARTEC control product	Quantity required
Self-regulating heating circuits on pipes	Freeze protection	Ambient-sensing	DTW (on panel)	1 per control panel
Self-regulating heating circuits on pipes	Temperature maintenance or tight temperature control	Line-sensing	BSTW (off pipe , local only) PBTW-200-E (on pipe, local only) DETU-300-CN (off pipe, local and remote)	1 per circuit
Multiple self-regulating heating circuit(s) for frost protection on tanks	Freeze protection or wide band temperature control	Ambient-sensing	DTW (on panel)	1 per control panel
Single self-regulating heating circuit(s) on temperature sensitive tanks	Temperature maintenance or tight temperature control	Point-sensing	BSTW (off tank, local only) DETU-300-CN (off tank, local and remote) ESTM-20-E (local and remote indication)	1 per circuit

### → Example

- The application is temperature maintain for the pipe in a hazardous area. The ambient temperature is below the maintain temperature for only a few months every year and the customer wants to conserve energy. No remote indication or communication is required.

**appropriate control equipment = PBTW-200-E**

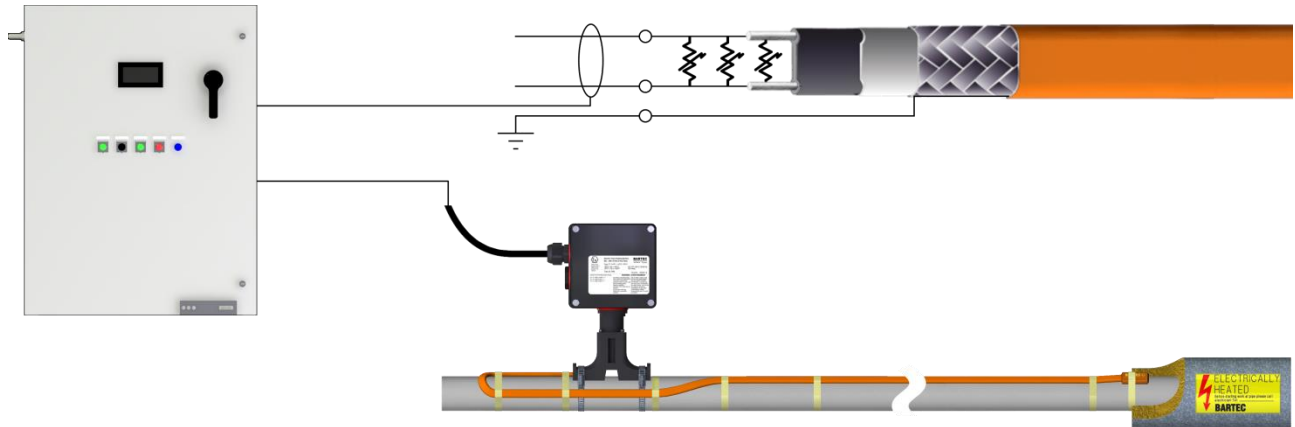
*Note: Since the PBTW-200-E includes the power connection enclosure the PBS-200-E kit (from Step 11) is not required.*

**Step 13: Determine if monitoring equipment is required:**

Monitoring increases system reliability by detecting faults before they become a major problem. Consider the following points when planning heating circuit monitoring:

- While you may select only one method of control for each trace heating circuit, you can make use of various monitoring options. The use of monitoring increases overall system reliability because failures in the heating and power distribution systems get reported to operations personnel.
- BARTEC recommends to always use, at a minimum, ground-fault monitoring. For the small additional cost, you get a monitoring system that reliably reports physical damage to the trace heating system, which is a common failure mode.
- For sensitive applications, add end of line monitoring with either a high profile end seal or an end of line light. The end of line light gives the most direct visual feedback on system performance.

**Conventional system layout with monitoring panel and ground fault equipment protection device**



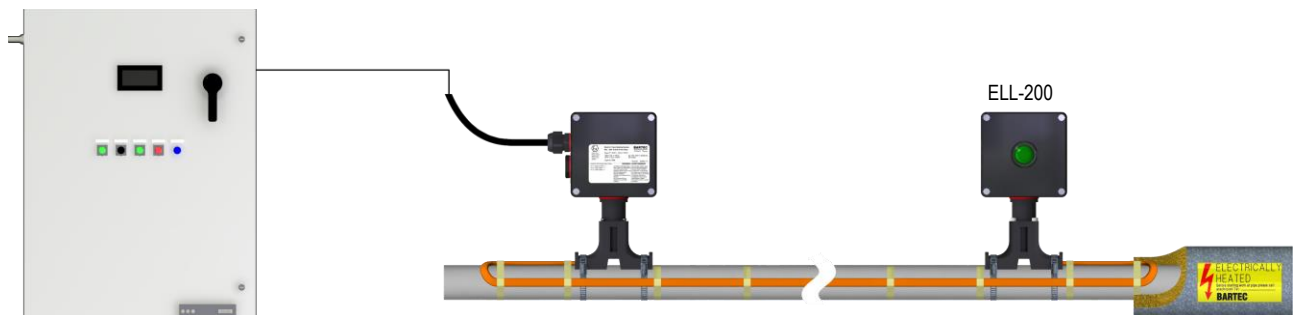
**Maintenance access through a high profile end seal**

The high profile end seal is used to quickly locate the end of the heating circuit for troubleshooting in the field. It provides a convenient way to locate the end of the circuit and for testing of voltage presence at the end of the circuit.



**Continuity monitoring using an end of line light**

Continuity monitoring is used to verify that the trace heater circuit has voltage present at the termination end. This is often assured by an end of line light installed as part of the end seal. In addition to the visual feedback at the end of the trace heater circuit it provides easy maintenance accessibility.



**Table L: Selecting the appropriate monitoring equipment:**

Base your selection on the number and type of trace heating circuits to be installed, the type of continuity monitoring you need, and the area classification:

TABLE L: Monitoring Equipment Selection Recommendations				
Heating circuit type	Application	Monitoring options	Suitable BARTEC monitoring product	Quantity required
Self-regulating heating circuits on pipes	Freeze protection	High profile end seal or signal light for indication	ELS-200 ELL-200	1 per circuit
Self-regulating heating circuits on pipes	Temperature maintenance or tight temperature control	High profile end seal	ELS-200	1 per circuit

→ **Example**

- The application is temperature maintenance (25 °C) of a pipe in a hazardous area.
- The maintenance team wants to be able to quickly locate the end seal.

**appropriate monitoring equipment = ELS-200**

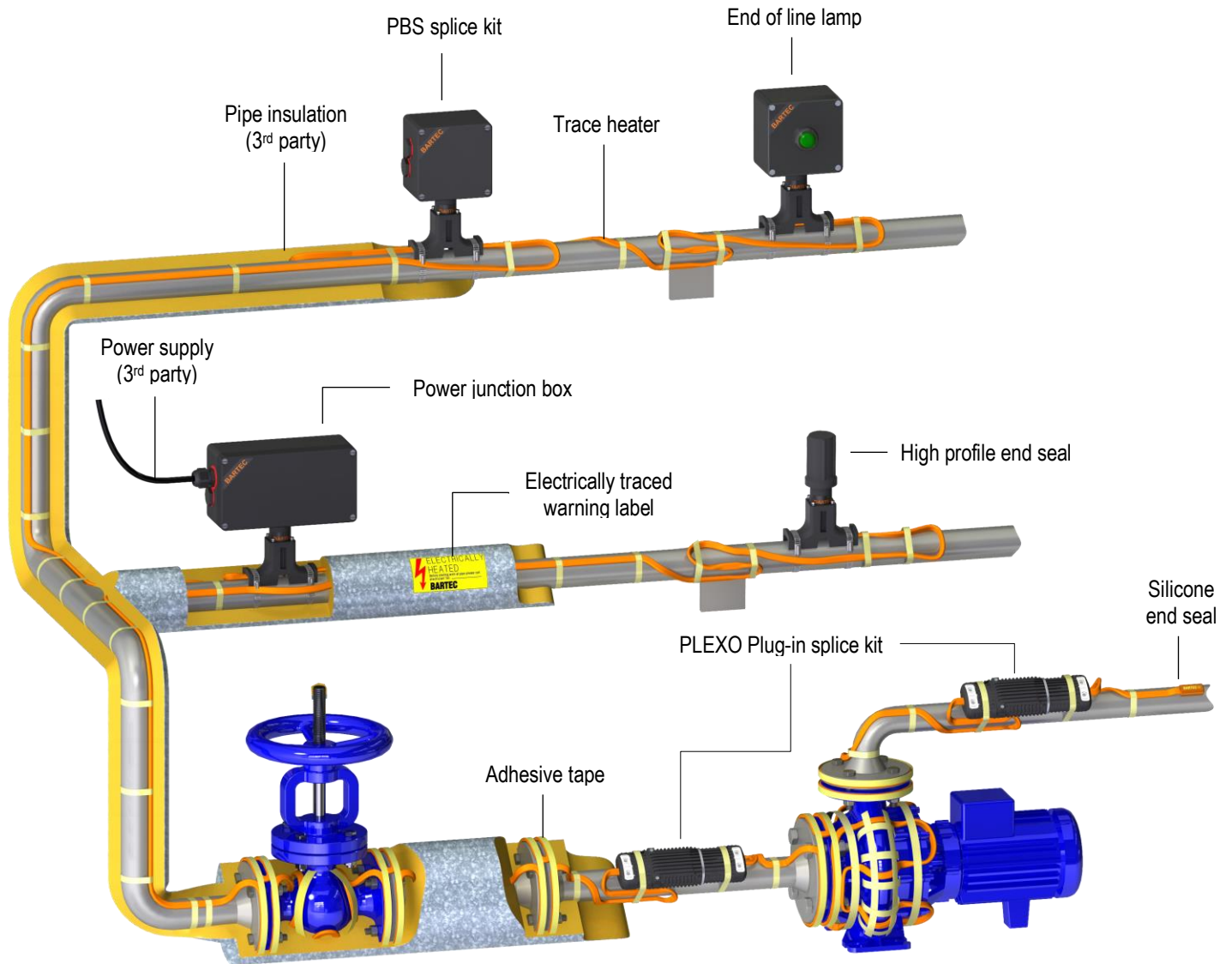
**Step 13: Finalize the required Materials List (BOM):**

Accessories including the glass tape for attachment and pipe straps for the components and electrical traced warning labels

→ **Example**

- Heating cable catalog no. (see Step 1-5 beginning on page 6) and required length (see Step 9 on page 16) = **10PSB2-CT** **64 m**
- Temperature control device including power connection enclosure (see Step 12 on page 18) = **PBTW-200-E** **1 pc.**
- High profile end seal for ease of maintenance (see Step 12 on page 18) = **ELS-200** **1 pc.**
- Accessories (see section *Accessories* on page 27-30):
  - Glass cloth tape (see selection table in section *Accessories*) **GT-164** **2 rolls**
  - Pipe straps (see selection table in section *Accessories*) **PC-01** **4 pcs.**
  - Electrically traced warning labels **HTWL-EN** **10 pcs.**

The following figure shows a sample heating circuit including typical components:



The following pages list compatible components for BARTEC Self regulating trace heating systems in hazardous locations. The respective installation instructions are included in the scope of delivery.



## Trace heaters

	<p><b>PSB trace heater with polyolefin outer jacket</b></p> <p>Self regulating trace heater for installation on pipes, tanks etc.</p> <p><i>Polyolefin outer jacket: suitable for exposure to aqueous chemicals</i></p> <p><i>Maximum maintain temperature ("power on"): 65 °C</i>  <i>Maximum withstand temperature ("power off"): 85 °C</i></p> <p><i>Approved for Zone 1 and Zone 2 areas. See data sheet for full details.</i></p>	<p><i>W/m</i></p> <p>10 W/m 15 W/m 26 W/m 33 W/m</p>	<p><i>Catalog No.:</i></p> <p>3PSB2-CR 5PSB2-CR 8PSB2-CR 10PSB2-CR</p>	<p><i>Order No.:</i></p> <p>101766 104866 106466 108266</p>	<p><i>Part No.:</i></p> <p>07-5801-2106 07-5801-2156 07-5801-2266 07-5801-2336</p>
	<p><b>PSB trace heater with fluoropolymer outer jacket</b></p> <p>Self regulating trace heater for installation on pipes, tanks etc.</p> <p><i>Fluoropolymer outer jacket: suitable for exposure to organic chemicals</i></p> <p><i>Maximum maintain temperature ("power on"): 65 °C</i>  <i>Maximum withstand temperature ("power off"): 85 °C</i></p> <p><i>Approved for Zone 1 and Zone 2 areas. See data sheet for full details.</i></p>	<p><i>W/m</i></p> <p>10 W/m 15 W/m 26 W/m 33 W/m</p>	<p><i>Catalog No.:</i></p> <p>3PSB2-CT 5PSB2-CT 8PSB2-CT 10PSB2-CT</p>	<p><i>Order No.:</i></p> <p>101566 104766 106066 107966</p>	<p><i>Part No.:</i></p> <p>07-5801-2105 07-5801-2155 07-5801-2265 07-5801-2335</p>
	<p><b>MSB trace heater</b></p> <p>Self regulating trace heater for installation on pipes, tanks etc.</p> <p><i>Fluoropolymer outer jacket: suitable for exposure to organic chemicals</i></p> <p><i>Maximum maintain temperature ("power on"): 110 °C</i>  <i>Maximum withstand temperature ("power off"): 130 °C</i></p> <p><i>Approved for Zone 1 and Zone 2 areas. See data sheet for full details.</i></p>	<p><i>W/m</i></p> <p>10 W/m 15 W/m 25 W/m 30 W/m 40 W/m</p>	<p><i>Catalog No.:</i></p> <p>3MSB2-CT 5MSB2-CT 8MSB2-CT 10MSB2-CT 12MSB2-CT</p>	<p><i>Order No.:</i></p> <p>320845 320846 320847 320849 320851</p>	<p><i>Part No.:</i></p> <p>07-5804-210Y 07-5804-215Y 07-5804-225Y 07-5804-230Y 07-5804-240Y</p>
	<p><b>HSB trace heater</b></p> <p>Self regulating trace heater for installation on pipes, tanks etc.</p> <p><i>Fluoropolymer outer jacket: suitable for exposure to organic chemicals</i></p> <p><i>Maximum maintain temperature ("power on"): 120 °C</i>  <i>Maximum withstand temperature ("power off"): 200 °C</i></p> <p><i>Approved for Zone 1 and Zone 2 areas. See data sheet for full details.</i></p>	<p><i>W/m</i></p> <p>10 W/m 15 W/m 30 W/m 45 W/m 60 W/m</p>	<p><i>Catalog No.:</i></p> <p>3HSB2-CT 5HSB2-CT 10HSB2-CT 15HSB2-CT 20HSB2-CT</p>	<p><i>Order No.:</i></p> <p>109366 109766 110666 111166 111666</p>	<p><i>Part No.:</i></p> <p>07-5803-210A 07-5803-215A 07-5803-230A 07-5803-245A 07-5803-260A</p>
	<p><b>HTSB trace heater</b></p> <p>Self regulating trace heater for installation on pipes, tanks etc.</p> <p><i>Fluoropolymer outer jacket: suitable for exposure to organic chemicals</i></p> <p><i>Maximum maintain temperature ("power on"): 250 °C</i>  <i>Maximum withstand temperature ("power off"): 250 °C</i></p> <p><i>Approved for Zone 1 and Zone 2 areas. See data sheet for full details.</i></p>	<p><i>W/m</i></p> <p>15 W/m 30 W/m 45 W/m 60 W/m 75 W/m</p>	<p><i>Catalog No.:</i></p> <p>5HTSB2-CT 10HTSB2-CT 15HTSB2-CT 20HTSB2-CT 25HTSB2-CT</p>	<p><i>Order No.:</i></p> <p>302932 302933 302934 302945 302946</p>	<p><i>Part No.:</i></p> <p>07-5819-7152 07-5819-7302 07-5819-7452 07-5819-7602 07-5819-7752</p>

Power connection, splice and junction components



**PBS-200-E/E10 Single power entry connection kit "on pipe"**

For connection of a trace heater inside a junction box. Includes a mounting stand for on-pipe installation and a silicone end seal.

Maximum power conductor size:  
 PBS-200-E 6 mm<sup>2</sup>  
 PBS-200-E10 10 mm<sup>2</sup>

2 pipe straps per stand required.  
 For a complete list of kit contents and approvals see data sheet.

*PBS-200-E:*

Catalog No.: PBS-200-E  
 Order No.: 430173  
 Part No.: 27-54P2-4212/1210

*PBS-200-E10:*

Catalog No.: PBS-200-E10  
 Order No.: 430174  
 Part No.: 27-54P2-4312/3B10



**PBS-300-E/E10 Single power entry connection kit "off pipe"**

For connection of a trace heater inside a junction box. Includes a mounting stand for off-pipe installation and a silicone end seal.

Maximum power conductor size:  
 PBS-300-E 6 mm<sup>2</sup>  
 PBS-300-E10 10 mm<sup>2</sup>

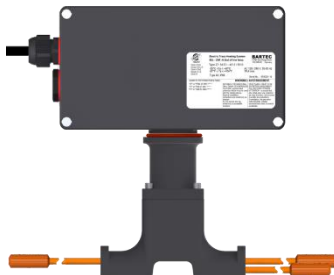
2 pipe straps per stand required.  
 For a complete list of kit contents and approvals see data sheet.

*PBS-300-E:*

Catalog No.: PBS-300-E  
 Order No.: 430205  
 Part No.: 27-54P2-4211/1210

*PBS-300-E10:*

Catalog No.: PBS-300-E10  
 Order No.: 430206  
 Part No.: 27-54P2-4311/3B10



**PBM-200-E/E10 Multiple power entry connection kit "on pipe"**

For connection of up to 3 trace heaters inside a junction box. Includes a mounting stand for on-pipe installation and 2 silicone end seals.

Maximum power conductor size:  
 PBM-200-E 6 mm<sup>2</sup>  
 PBM-200-E10 10 mm<sup>2</sup>

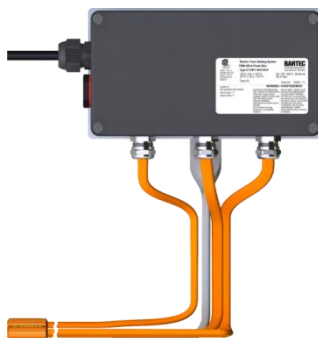
2 pipe straps per stand required.  
 For a complete list of kit contents and approvals see data sheet.

*PBM-200-E:*

Catalog No.: PBM-200-E  
 Order No.: 430210  
 Part No.: 27-54P2-4433/1210

*PBM-200-E10:*

Catalog No.: PBM-200-E10  
 Order No.: 430211  
 Part No.: 27-54P2-4533/3B10



**PBM-300-E/E10 Multiple power entry connection kit "off pipe"**

For connection of up to 3 trace heaters inside a junction box. Includes a mounting stand for off-pipe installation and 2 silicone end seals.

Maximum power conductor size:  
 PBM-300-E 6 mm<sup>2</sup>  
 PBM-300-E10 10 mm<sup>2</sup>

2 pipe straps per stand required.  
 For a complete list of kit contents and approvals see data sheet.

*PBM-300-E:*

Catalog No.: PBM-300-E  
 Order No.: 430212  
 Part No.: 27-54P2-4431/1210

*PBM-300-E10:*

Catalog No.: PBM-300-E10  
 Order No.: 430213  
 Part No.: 27-54P2-4531/3B10



## Control and monitoring units

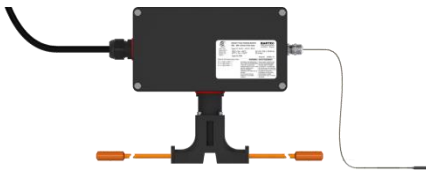


### Mechanical thermostats for hazardous locations

Select this thermostat when the control unit must be located in a hazardous location and mechanical ruggedness is important and the control device is separate from the power connection.

*Set point: -4 °C/163°C*

Catalog No.: DTW  
Order No.: 246338  
Part No.: 27-6CA2-2411/2000



### PBTW Mechanical thermostat for hazardous locations (on-pipe installation)

Select this thermostat when the control unit is located in a hazardous location, ruggedness is important and the control device is integrated with the power connection and can be mounted on the pipe.

*For a complete list of temperature range options, kit contents and approvals see datasheet.*

*Sensor temperature range -20 °C to 50 °C:*

Catalog No.: PBTW-200-E050  
Order No.: 427650  
Part No.: 27-54D2-4422/C210

*Sensor temperature range 0 °C to 190 °C:*

Catalog No.: PBTW-200-E190  
Order No.: 427651  
Part No.: 27-54D2-4422/D210



### BSTW II Mechanical thermostat for hazardous locations (off-pipe installation)

Select this thermostat when the control unit is located in a hazardous location, ruggedness is important and the control device is integrated with the power connection and is to be mounted off the pipe.

*For a complete list of temperature range options, kit contents and approvals see datasheet.*

*Sensor temperature range -20 °C to 50 °C:*

Catalog No.: BSTW-300-E50  
Order No.: 345675  
Part No.: 27-6DF2-5232/1200

*Sensor temperature range 0 °C to 190 °C:*

Catalog No.: BSTW-300-E190  
Order No.: 413371  
Part No.: 27-6DF2-5232/1C00



### DETU Electronic control unit for hazardous locations

The DETU-300-CN single-point electronic controller senses pipe or tank temperatures to provide tight temperature control for process applications. It detects and alarms on low and high temperatures and features networking communication capabilities.

*For a complete list of kit contents and approvals see datasheet.*

Catalog No.: DETU-300-CN  
Order No.: 392790  
Part No.: 17-8887-2636/2221



### ESTM-30

The BARTEC ESTM-30 single-point controller senses pipe or tank temperatures to provide tight temperature control for process applications. It features continuous monitoring technology to detect trace heating faults, monitor trace heating current and provides networking communication capabilities.

*For a complete list of kit contents and approvals see datasheet.*

Catalog No.: ESTM-30  
Order No.: 420943  
Part No.: 17-88C1-F22H/1R10

**Splice kits**



**PLEXO-TCS Low profile in-line splice**

In-line splice kit for connections below the insulation and cladding. The kit is re-entenable for ease of maintenance at pumps and vessels.. The kit is approved for Zone 1 and Zone 2 areas.

*For a complete list of kit contents, approvals and additional configurations see data sheet.*

Catalog No.: PLEXO-TCS  
 Order No.: 320724  
 Part No.: 27-59P2-0110

**End termination**



**ELS-200 high profile end seal**

End seal for access above the insulation. The kit is approved for Class I, II and III Div 2 areas.

*2 pipe straps per stand required.  
 For a complete list of kit contents and approvals see data sheet..*

Catalog No.: ELS-200  
 Order No.: 430293  
 Part No.: 27-54E2-4012/A000



**ELL-200 End of line lamp**

End of line lamp for connection of a trace heater. Includes a mounting stand for on-pipe installation. The kit is approved for Zone 1 and Zone 2 areas. Available with a Green or Red lens.

*2 pipe straps per stand required.  
 For a complete list of kit contents and approvals see data sheet.*

*Green lens:*  
 Catalog No.: ELL-200-E  
 Order No.: 430215  
 Part No.: 27-54E2-4212/F210  
*Red lens:*  
 Catalog No.: ELL-200-A  
 Order No.: 407406  
 Part No.: 27-54E1-4211/F010



**ELL-300 End of line lamp**

End of line lamp for connection of a trace heater. Includes a mounting stand for off-pipe installation. The kit is approved for Zone 1 and Zone 2 areas. Available with a Green or Red lens.

*2 pipe straps per stand required.  
 For a complete list of kit contents and approvals see data sheet.*

*Green lens:*  
 Catalog No.: ELL-300-E  
 Order No.: 430216  
 Part No.: 27-54E2-4211/F210  
*Red lens:*  
 Catalog No.: ELL-300-A  
 Order No.: 407406  
 Part No.: 27-54E1-4211/F010



**CAK-E5/E10 Cold applied end seal**

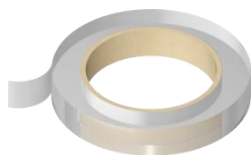
Silicone end seal for insulation of the end of the trace heater.

CAK-E5 5 pcs.  
 CAK-E10 10 pcs.

*For a complete list of kit contents and approvals see data sheet.*

*CAK-E5:*  
 Catalog No.: CAK-E5  
 Order No.: 404126  
 Part No.: 27-59CZ-90000001  
*CAK-E10:*  
 Catalog No.: CAK-E10  
 Order No.: 404128  
 Part No.: 27-59CZ-90000010

## Accessories



### Polyester adhesive tape

for use on pipes other than stainless steel

19 mm x 50 m per roll

Minimum installation temperature (dry surface): 5 °C

Maximum withstand temperature: 100 °C

Catalog No.: PT-164  
Order No.: 100706  
Part No.: 02-5500-0005

Tip: Refer to the following table to estimate the required number of tape rolls for your installation:

Pipe diameter DN (inch)	DN8 (1/4")	DN15 (1/2")	DN20 (3/4")	DN25 (1")	DN32 (1 1/4")	DN40 (1 1/2")	DN50 (2")	DN65 (2 1/2")	DN80 (3")	DN100 (4")	DN150 (6")	DN200 (8")	DN250 (10")	DN300 (12")	DN350 (14")	DN400 (16")	DN450 (18")	DN500 (20")	DN600 (24")
Required no. of tape rolls per 30 m of piping	1	1	1	1	1	1	2	2	2	3	4	5	6	7	7	8	9	10	12



### Glass cloth tape

for fixation of self-regulating trace heaters on  
all pipes including stainless steel / required  
during preparation of power limiting trace heat-  
ers

12 mm x 50 m per roll

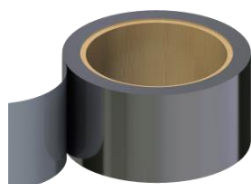
Minimum installation temperature (dry surface): -10 °C

Maximum withstand temperature: 200 °C

Catalog No.: GT-164  
Order No.: 392328  
Part No.: 02-5500-0047

Tip: Refer to the following table to estimate the required number of tape rolls for your installation (for fixation of trace heaters on pipes only)

Pipe diameter DN (inch)	DN8 (1/4")	DN15 (1/2")	DN20 (3/4")	DN25 (1")	DN32 (1 1/4")	DN40 (1 1/2")	DN50 (2")	DN65 (2 1/2")	DN80 (3")	DN100 (4")	DN150 (6")	DN200 (8")	DN250 (10")	DN300 (12")	DN350 (14")	DN400 (16")	DN450 (18")	DN500 (20")	DN600 (24")
Required no. of tape rolls per 30 m of piping	1	1	1	1	2	2	2	3	3	4	5	7	9	10	11	12	14	15	18



### Aluminum adhesive tape

for use on all pipe materials

50 mm x 50 m per roll

AT80:

Minimum installation temperature (dry surface): 5 °C

Maximum withstand temperature: 80 °C

AT150:

Minimum installation temperature (dry surface): 5 °C


Maximum withstand temperature: 150 °C

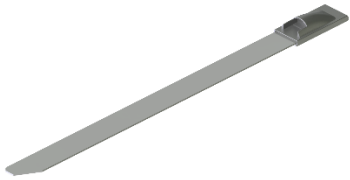
AT80:


Catalog No.: AT80-164  
Order No.: 100506  
Part No.: 02-5500-0003


AT150:

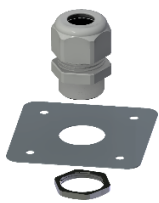
Catalog No.: AT150-164  
Order No.: 101606  
Part No.: 02-5500-0014

	<p><b>Stainless steel pipe straps</b></p> <p>stainless steel, for fixation of mounting stands on pipes etc. No special tooling required.</p>	<p>for pipe <math>\varnothing</math> up to 3" / DN80:</p> <p>Catalog No.: PC-1 Order No.: 435727</p> <p>for pipe <math>\varnothing</math> up to 10" / DN250:</p> <p>Catalog No.: PC-2 Order No.: 435729</p>
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	<p><b>Stainless steel cable ties</b></p> <p>for installation of power limiting trace heaters, mounting stands, etc.</p> <p>SSC-03: pipe <math>\varnothing</math> up to 3" / DN80 SSC-06: pipe <math>\varnothing</math> up to 6" / DN150</p> <p>Pack of 100 pcs.</p>	<p>SSC-03:</p> <p>Catalog No.: SSC-03 Order No.: 126227 Part No.: 03-6510-0208</p> <p>SSC-06:</p> <p>Catalog No.: SSC-06 Order No.: 126228 Part No.: 03-6510-0209</p>
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	<p><b>Stainless steel strapping ribbon &amp; buckles, 3/4"</b></p> <p>for bulk installation of mounting stands on pipes etc. Note: tensioning tool is required.</p> <p>SST-34/30: 19 mm x 30 m per roll SSB-34/100: pack of 100 pcs.</p>	<p>SST-34/30:</p> <p>Catalog No.: SST-34/30 Order No.: 126227 Part No.: 03-6510-0208</p> <p>SSB-34/100:</p> <p>Catalog No.: SSB-34/100 Order No.: 126228 Part No.: 03-6510-0209</p>
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	<p><b>Tensioning tool for stainless steel strapping ribbon</b></p> <p>Required for installation of stainless steel strapping ribbon</p>	<p>Catalog No.: SST-TT Order No.: 126207 Part No.: 03-5510-0003</p>
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	<p><b>Insulation entry bushing</b></p> <p>for protection of trace heaters or sensor cables at the point where they pass through the thermal insulation outer cladding</p>	<p>for PSB trace heaters:</p> <p>Catalog No.: IEB-P Order No.: 234006 Part No.: 05-0020-0472</p> <p>for HSB trace heaters:</p> <p>Catalog No.: IEB-H Order No.: 106730 Part No.: 05-0020-0091</p> <p>for PT100 sensor:</p> <p>Catalog No.: IEB-PT Order No.: 122964 Part No.: 05-0020-0261</p>
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## Electrically traced warning label

Warning label for trace heater circuits

*Recommended: electrical warning label every 3 m on the outside of the thermal cladding on a clearly visible place.*

*Packaged in rolls of 100 pcs.*



*German:*

Catalog No.: HTWL-DE  
Order No.: 113450  
Part No.: 05-2144-0046

*English:*

Catalog No.: HTWL-EN  
Order No.: 113550  
Part No.: 05-2144-0047

*French:*

Catalog No.: HTWL-FR  
Order No.: 120300  
Part No.: 05-2144-0703

*Russian:*

Catalog No.: HTWL-RU  
Order No.: 207439  
Part No.: 05-2144-0860



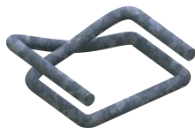
## Polyester fixing straps

for installation of trace heaters on tanks and vessels

*for tank diameters up to 3 m*

*19 mm x 850 m on full roll*

Catalog No.: PFS-850  
Order No.: 117932  
Part No.: 03-6500-0100



## Tensioning buckle

for use with the PFS-850 polyester fixing straps

Catalog No.: TB-075  
Order No.: 117939  
Part No.: 03-6515-0203

## Temperature sensors



## Hazardous Area 100 Ohm Platinum RTD

Platinum RTD mounted inside a 316SS sheath and includes a 20 mm radius mounting pad with an Aluminum head assembly.

*BRTD-D2 has a Ex e Aluminum head, 480 °C*


*BRTD-D1 has a Ex d Aluminum head, 480 °C*

*BRTD-D2:*


Catalog No.: BRTD-D2  
Order No.: 710148


*BRTD-D1:*


Catalog No.: BRTD-D1  
Order No.: 710149

	<p><b>PT-100 - 100 Ω Platinum RTD</b></p> <p>This Pt100 Ex sheathed resistance thermometer has been particularly designed for use in potentially explosive areas. As it meets the requirements of the Ex m type of protection, intrinsically safe circuits can be dispensed with.</p> <p><i>Approved for Zone 1 and Zone 2 areas see data sheet for full details as additional lengths are available for special order.</i></p>	<p><i>PT100-with 300 mm sensor and 2 m lead:</i></p> <p>Catalog No.: PT-100-300                  Order No.: 289768                  Part No.: 27-7125-1333/0220</p> <p><i>PT100 Ex e enclosure:</i></p> <p>Catalog No.: PT-100-Ex e                  Order No.: 122629                  Part No.: 07-5103-9024</p>
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**Spare parts**

	<p><b>On pipe cable gland kit and end seal</b></p> <p>Spare parts kit for use with PBS/PBM-200 kits for replacement of damaged or lost parts.</p>	<p>Catalog No.: CAK-SRS                  Order No.: 434968                  Part No.: 27-59CX-7C01/0001</p>
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	<p><b>Off pipe cable gland kit and end seal</b></p> <p>Spare parts kit for use with PBS/PBM-300 kits for replacement of damaged or lost parts.</p>	<p>Catalog No.: CAK-SRG                  Order No.: 434969                  Part No.: 27-59CX-7301/0001</p>
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	<p><b>Splice adaptor kit</b></p> <p>Provides the additional parts to use the PBS-200-E/E10 junction box as an above the insulation splice kit.</p>	<p>Catalog No.: CAK-M25                  Order No.: 434980                  Part No.: 27-59CZ-9901/0000</p>
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## Installation

### Preparation

Before installing any electric trace heating, the person installing must check if the trace heating has been designed and planned correctly. It is particularly essential to verify the following points:

- complete project planning documentation, operating instructions and installation instructions.
- correct selection of the trace heater and accessories with respect to:
  - calculation of heat losses
  - max. permissible operating temperature
  - max. permissible ambient temperature
  - temperature class
  - heating circuit length

Before installing, make sure that all piping and equipment is properly installed and pressure tested.

### Required tools / equipment

The following tools are required for installation of the BARTEC Self regulating trace heating systems:

- Wire cutters
- Insulation resistance meter with a minimum testing voltage of 500 Vdc and a maximum testing voltage of 2500 Vdc.



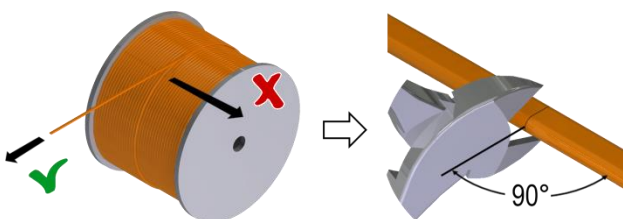
1

### Unrolling the trace heater

#### **⚠ WARNING**

Risk of short circuit and/or material damage. Keep the trace heater ends dry before and during installation.

- Unroll the required trace heater in a straight line and cut to the correct length. Cut off the trace heater ensuring a straight cut.
- Do not bend or pinch the trace heater, or pull it over sharp edges.



2

### Installation on pipes

This step is necessary for plastic pipes only since plastic pipes conduct heat less efficiently than metal pipes do. For metal pipes continue with step 4.

- Place aluminium tape where the trace heater will be attached for better heat distribution.



3

#### **⚠ CAUTION**

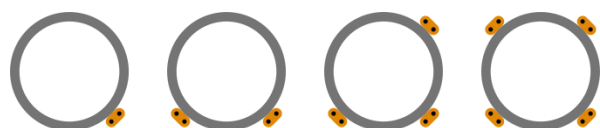
Risk of injury and/or material damage. Never step on or drive over the trace heater. Do not use it as a loop for stepping on.

- Install the trace heater in a straight line along the pipe. This saves time, helps to avoid installation mistakes and prevents damage to the trace heater during the thermal insulation work.



4

- Preferably install the trace heater in the lower half of the pipe, **but not on the lowest point**. This prevents mechanical damage and allows for better heat distribution.
- If you use multiple trace heaters, position them with an offset of 90°.



5



**Fastening**

Select the correct fastening material:

- Use polyester adhesive tape or glass cloth tape that suits the expected temperatures.
- Preferably use BARTEC adhesive tapes.
- Never use PVC electrical tape or self-adhesive tapes containing PVC or VC.
- Do not use metal wire or banding.



6

**Trace heater routing**

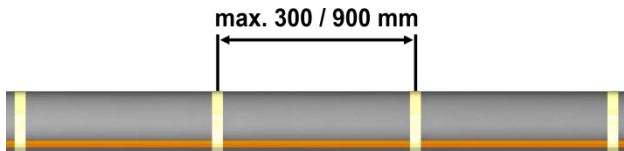
- On fittings, valves etc. you should leave a sufficiently large trace heater loop to ensure that the equipment is easily accessible. This way, heating circuits do not have to be cut up for maintenance or replacement works.
- Due to the higher heat losses from fittings, valves, flanges etc. an additional length of trace heater is required. This requirement is specified in the project planning documents.
- The following illustrations show typical types of installation.

**NOTICE**

The bending radius of the trace heater must always be at least 25 mm (for HTSB 35 mm). Do not bend on the narrow axis.

9

- Fasten the trace heater with the adhesive tape at intervals of at least 300 mm on plastic pipes or 900 mm on steel pipes.

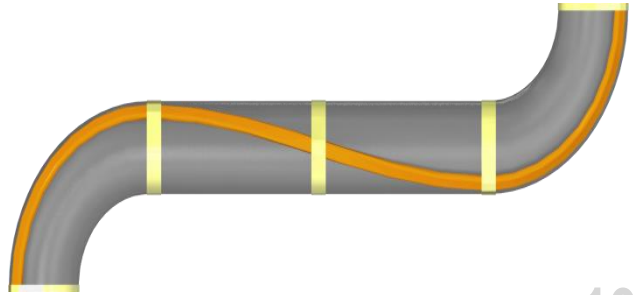


**NOTICE**

In order to ensure good heat transmission the trace heater must have a flat, flush fit over the whole length. If necessary, reduce the distances between the fixing points.

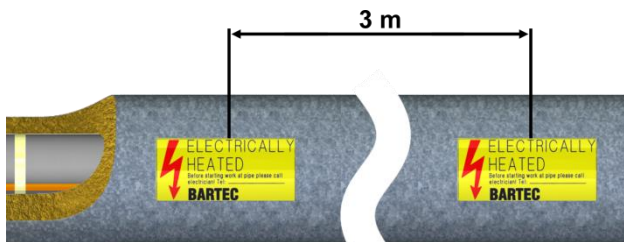
7

- Installation on bends:



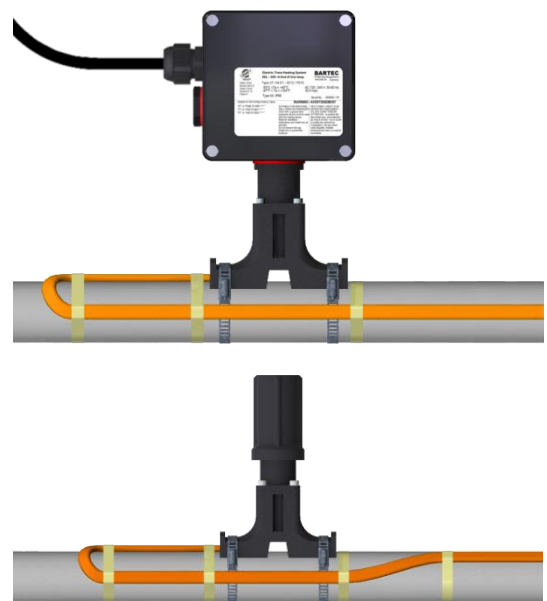
10

- Apply the pipe's insulation according to the manufacturer's installation instructions.
- Apply an electrical warning label every 3 m on a clearly visible place.



8

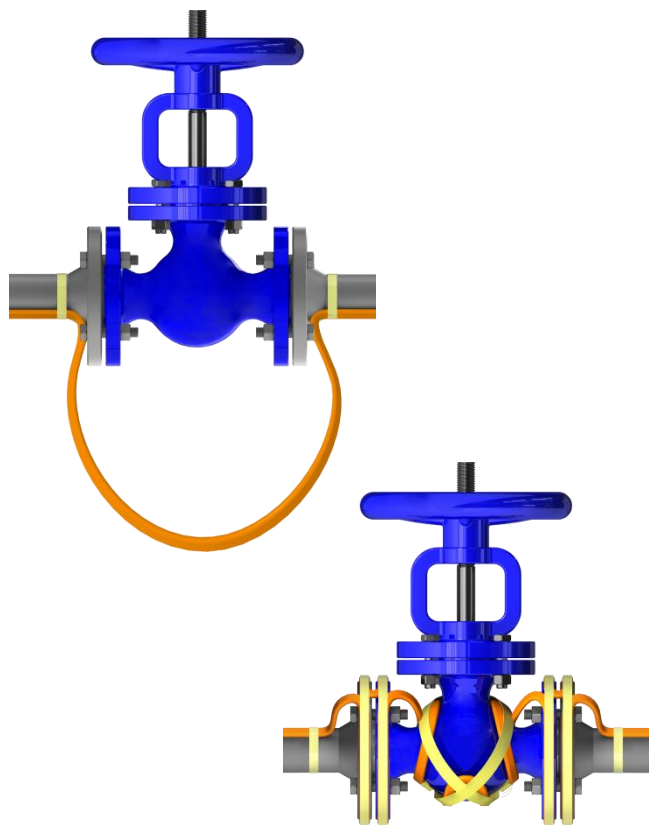
- Installation of service loops on components:



11

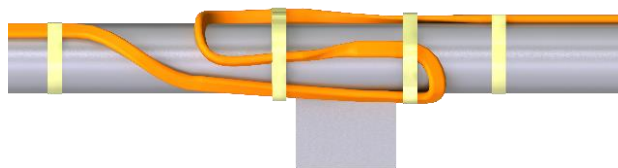


- Installation on valves:



12

- Installation on pipe supports:



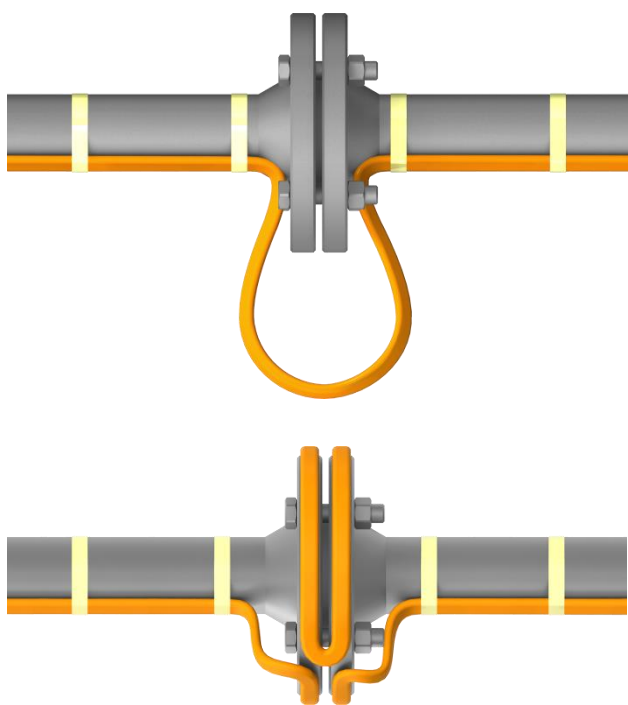
14

- Installation on pressure gauges:



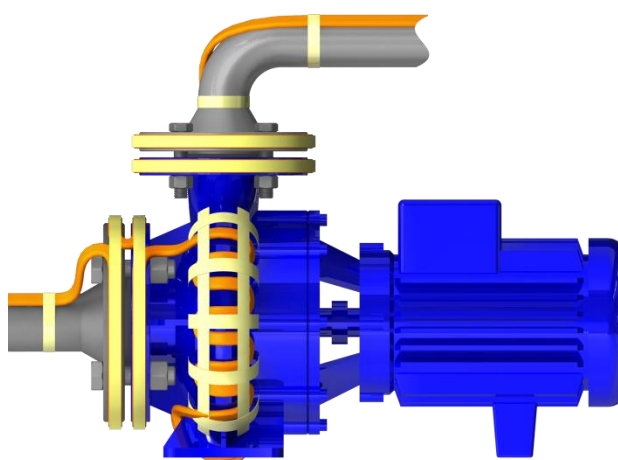
15

- Installation on flanges:



13

- Installation on pumps:



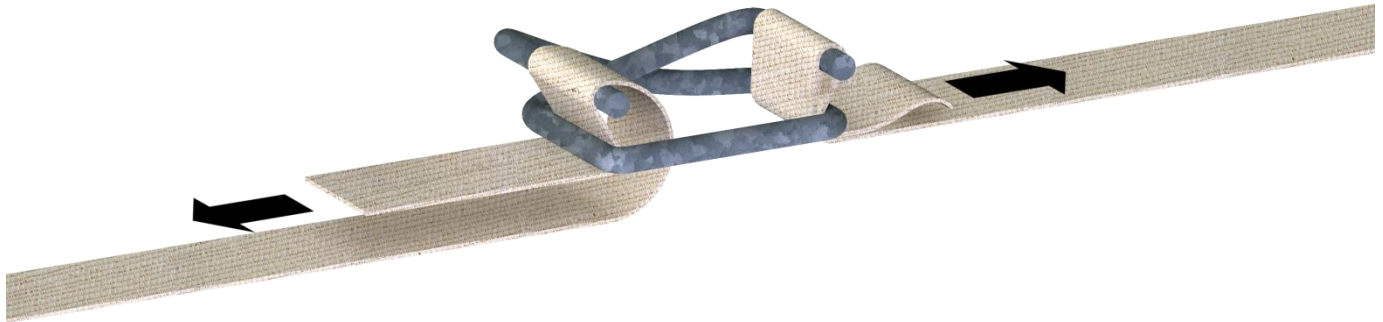
16

**Installation on tanks and vessels**

- For tank diameters of up to 2 m the trace heater is attached using polyester fixing straps and tensioning buckles.



- To fasten the fixing straps thread the polyester straps through the tensioning buckle as shown and pull the ends of the straps.

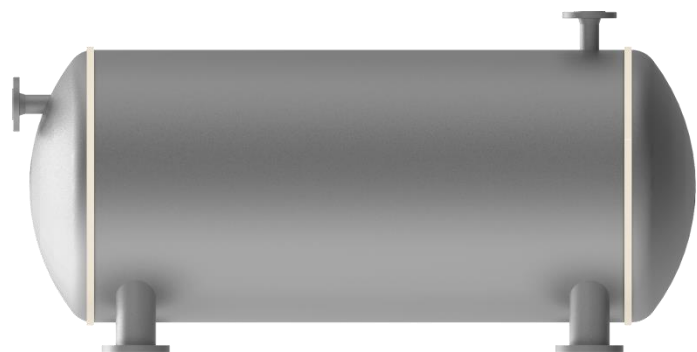


- At first, install fixing straps around the beginning and end of the tank and fasten them with slight tension.

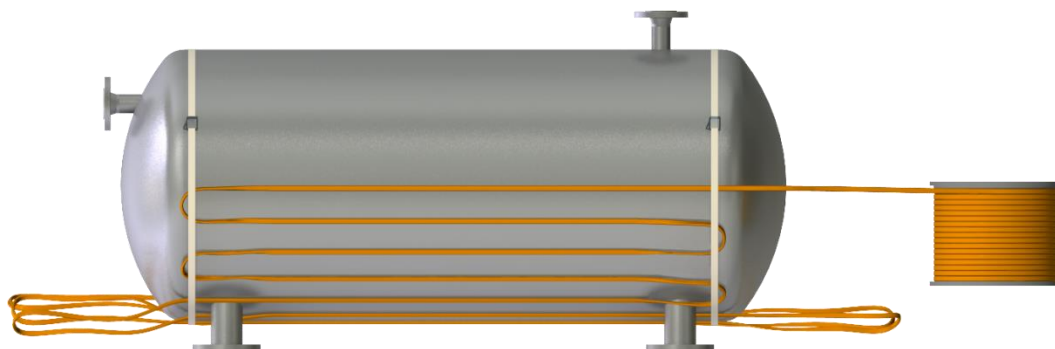
**Upright tank**



**Horizontal tank**

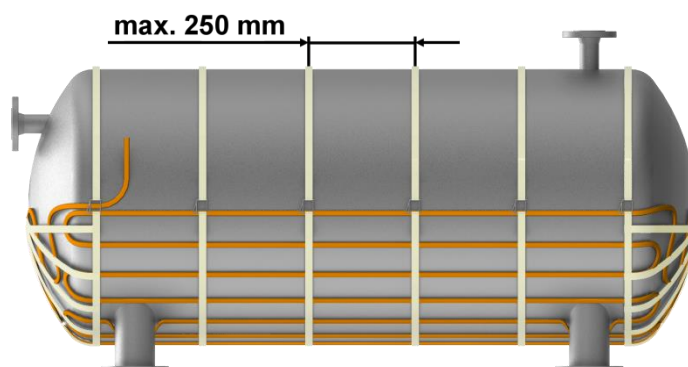


- Install the trace heater beginning at the supply point.
- Fix it at the distances specified in the project planning documentation. Use the pre-mounted fixing straps to hold the trace heaters in place.
- Allow for material addition for the bases.



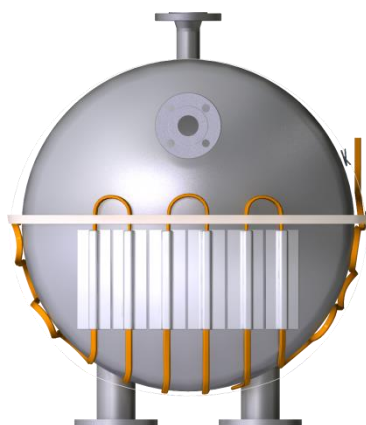
19

- Align the trace heater exactly and fix it firmly to the bases and the cylinder using additional fixing straps.
- To avoid damage to the trace heater, make sure that the fixing straps are not tightened too firmly. It should be possible to move the trace heater slightly under the fixing straps.
- The distances between the fixing straps should not exceed 250 mm.



20

- Finally, place aluminium tape on areas of loose contact of the trace heater.
- This step improves heat transfer and prevents insulating material being trapped between the trace heater and the tank.



21

## Tests and commissioning

### Measurement of the insulation resistance

The measurement of the insulation resistance is used to determine damage to the trace heater and possible installation faults. It must be carried out at the following times:

- Preliminary test (on the reel, before installation of the trace heater on the construction site; refer to section *Acceptance Report* on page 40)
- Acceptance test (after installation of the heating circuit and before installation of the thermal insulation; refer to section *Acceptance Report* on page 40)
- Final inspection (immediately after completion of work on the thermal insulation)
- Upon commissioning
- Before switching on the installation

#### Preparation of the measurement:

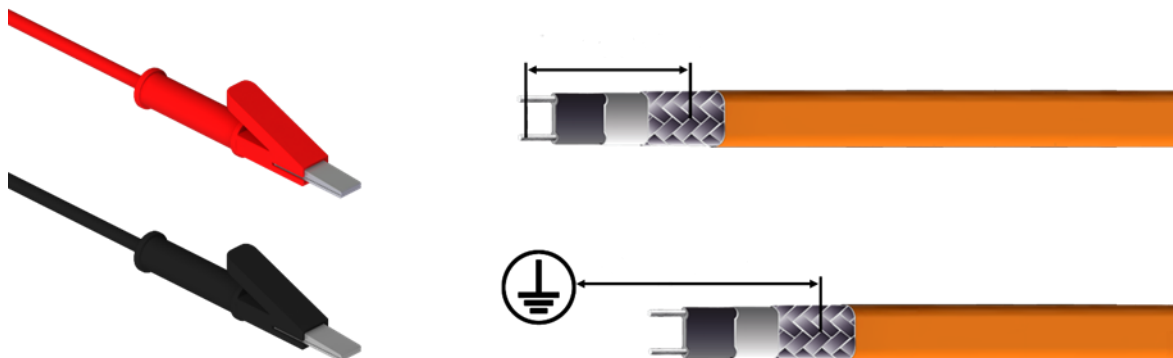
- De-energize the heating circuit.
- Disconnect the thermostat or controller, if installed.
- Disconnect the bus wires and PE wires from the terminal block, if installed.
- For the measurement you will need a megohmmeter with, at least, a minimum testing voltage of 500 Vdc and a maximum testing voltage of 2500 Vdc.

#### Test 1 - Conducting the measurement between the bus wires and the grounding braid:

- Set the test voltage to 0 Vdc.
- Connect the negative (-) lead to the grounding braid of the trace heater.
- Connect the positive (+) lead to both trace heater bus wires simultaneously.
- Turn on the megohmmeter and set the voltage to 500 Vdc.
- Apply the voltage for 1 minute. The meter reading should stabilize. Rapid changes in the reading indicate a breakdown of the insulation.
- Record the insulation resistance value in the Inspection Record.
- Repeat the measurement at 1000 and 2500 Vdc.

#### Test 2 - Conducting the measurement between the grounding braid and PE:

- Repeat the measurement between the grounding braid and PE (again, at 500, 1000 and 2500 Vdc).



#### Results:

- Properly installed dry and clean trace heater sets should measure thousands of megohms, regardless of the trace heater length or measuring voltage (0-2500 Vdc). Even if optimum conditions may not apply, all insulation resistance values should be greater than the IEC 60079-30.1:2015 minimum recommendation of 20 megohms. However, BARTEC strongly recommends a minimum reading of 1000 megohms. If the reading is lower or fluctuating, refer to section *Troubleshooting* on page 39.
- Insulation resistance values for Test 1 and 2; for any particular circuit, should not vary more than 25 percent as a function of measuring voltage. Greater variances may indicate a problem with your trace heating system; confirm proper installation and/or contact your local BARTEC representative for assistance.

## **⚠ WARNING**

Risk of fire or electrical shock. If the insulation resistance is insufficient you must fix the heating circuit before putting it into operation.

#### After the measurement:

If trace heater meets all resistance criteria:

- Reconnect the bus wires.
- Reconnect any thermostat or controller.
- Reenergize the circuit.

## Acceptance test and acceptance test report

- After completion of the installation work (before installation of the thermal insulation) each heating circuit must be accepted, if possible in the presence of the client.
- All further tests must also be documented in an acceptance test report (refer to section *Acceptance report / Record of inspection* on page 40).

## NOTICE

**Claims under warranty will not be considered if the acceptance report is not filled in completely.**

- After completion of work on the thermal insulation final inspection and acceptance of the individual heating circuits is recommended. Usually, this is the task of the client or the final customer (= final inspection).

## Commissioning

Each heat tracing system can only be put into operation if the following conditions are fulfilled:

- The acceptance test reports for each heating circuit are complete and the trace heating system has been accepted.
- All components of the heating circuit are completely installed and are in working order.
- It has been ensured that the heating circuit is operated in conformance with the technical data specified by BARTEC.

## NOTICE

**Upon a cold start, additional heating power is required for heating up tanks and pipes. When starting the system you should allow sufficient time for heat up. For further information on heat up calculations contact your local BARTEC representative.**

## Operation

During operation of the electric trace heating system you must ensure that all components of the system are operated within the operating data specified by BARTEC.

This applies particularly to observation of the maximum temperature. Operation within these operating data is a precondition for possible later warranty claims.

## System documentation

Complete documentation must be carried out for each system, from the project planning stage, through installation and commissioning up to periodic maintenance of the trace heating system.

This documentation should include the following:

- Project planning documents
- Manuals of all of the components of the heating system
- Heat loss calculation
- Selection of the trace heater
- Layout plans with division of heating circuits
- Circuit graphs
- Acceptance reports
- Reports on repairwork and any operations carried out on the tank/pipe system, trace heating system and thermal insulation
- Inspection reports

## Maintenance

### Visual and functional inspection

- Regularly check the thermal insulation for possible damage, missing seals, cracks, damage to the outer jacket, missing thermal insulation bushings for trace heaters and cables, penetrated water or chemicals. If the thermal insulation is damaged the trace heater should be checked for possible damage.
- Damaged trace heaters must be replaced.
- Parts subject to wear must be replaced (e.g. seals, locking plates etc).
- Check junction boxes, splices, end terminations etc. for corrosion and possible mechanical damage. Make sure that all enclosure covers are properly in place.
- If present, check the temperature controller connecting cables and sensors for damage and that their installation is protected against mechanical damage.

### Electrical inspection

- Measurement of the insulation resistance should be seen as a permanent part of regular maintenance. For instructions on how to perform the test refer to section *Measurement of the insulation resistance* on page 36.

**Inspection intervals**

- For frost protection installations inspections should be carried out annually before the heating period begins.
- For systems designed to maintain process temperatures, inspections should be carried out at regular intervals, but at least twice a year.

**Personnel training courses**

- Regular maintenance should be carried out by trained, experienced maintenance personnel.
- It is recommended that maintenance personnel is updated on new developments in application technology and maintenance.

**Repairwork on piping or thermal insulation**

- Ensure that all safety procedures and precautions in the area for repairs are followed.
- Take care that the heat tracing system is not damaged during repairwork on the pipes or insulation.
- After completion of the repairwork:
  - Make sure that any repaired heating circuits are properly installed and tested according to the project planning documentation.

 **WARNING**

**Risk of fire or electrical shock due to damaged components. Remember that self-regulating trace heaters are designed to be installed only once.**

- Carry out a visual, functional and electrical test (refer to section *Tests and commissioning* on page 36).

## Troubleshooting

Problem	Possible cause	Remedy
Trace heater remains cold	No power supply	Check the power wiring for continuity to circuit breaker.
	Trace heater bus wires or power wiring not properly connected	Connect the trace heater and power wiring according to the installation instructions.
	Control unit adjusted incorrectly	Adjust the control unit according to the installation instructions.
Automatic circuit breaker tripped	Automatic circuit breaker defective	Replace the automatic circuit breaker.
	Automatic circuit breaker has wrong tripping characteristics, e. g. "B" instead of "C"	Install an automatic circuit breaker with Type-C tripping characteristics or contact the factory for Type-B tripping characteristics.
	Nominal circuit breaker size is insufficient	Install an automatic circuit breaker with higher capacity. Observe the maximum amperage of all components of the trace heating circuit!
	Maximum heating circuit length has been exceeded	Split the heating circuit into separate circuits.
	End seal has not been installed	Install the end seal according to the installation instructions.
	Short circuit	Identify the cause and remedy the fault (e. g. ensure that trace heater bus wires are not twisted together).
	Humidity inside the connection system or end seal	Dry the components. For junction boxes, be sure that the cable gland is correctly installed and sealing properly.
Ground fault protection is disengaged	Trace heater damaged	Replace the trace heater at the point where it is damaged.
	Moisture in the components	Dry the components. For junction boxes, be sure that the cable gland is correctly installed and sealing properly.
	Ground fault protection defective	Replace the ground fault protection device(s).
Low or inconsistent insulation resistance	Trace heater damaged	Replace the trace heater at the point where it is damaged.
	Moisture in the components	Dry the components. For junction boxes, be sure that the cable gland is correctly installed and sealing properly.
	Arcing due to damaged trace heater insulation	Replace the trace heater at the point where it is damaged.
	Arcing due to inadequate stripping distance between heating element and grounding braid	Check the stripping distance between bus wires//heating element and grounding braid at all power, splice and end seal connections to ensure adequate separation.
	Short-circuit between the grounding braid and the heating element or the grounding braid and the pipe	Check for cut or damaged cable or inadequate stripping length.
	Test leads touching the junction box	Relocate test leads and retest.

*Note: High pipe temperature may lower the insulation resistance reading relative to earlier readings on a cold pipe.*

**Acceptance report / Record of inspection**

**Protocol type**

Inspection before commissioning <input type="checkbox"/>	Inspection after modification <input type="checkbox"/>	Periodic inspection <input type="checkbox"/>
Visual inspection <input type="checkbox"/>	Close inspection <input type="checkbox"/>	Detailed inspection <input type="checkbox"/>

**Project information**

Project / Customer	
Order Comm. No. / BARTEC Order No.	
Date	

**Installation details**

Heating circuit type	Electric Trace Heating of Pipes <input type="checkbox"/>	Electric Trace Heating of Tanks/Vessels <input type="checkbox"/>
Ex version	yes <input type="checkbox"/> no <input type="checkbox"/> Zone <input type="text"/>	Temperature class T <input type="checkbox"/> Ex group <input type="text"/>
Switchgear / Distribution panel	Included in the scope of delivery	UV Name ESS/LDP
	yes <input type="checkbox"/> no <input type="checkbox"/>	Test report <input type="checkbox"/>
Thermal insulation	Thermal insulation material	Thermal insulation thickness in mm (inch) <input type="text"/>
	Check <b>before</b> installation of the insulation Date / Name / Signature	Check <b>after</b> installation of the insulation Date / Name / Signature

**Heating circuit data**

Heating Circuit No.									
Sub-Heating circuit	yes <input type="checkbox"/>	no <input type="checkbox"/>	yes <input type="checkbox"/>	no <input type="checkbox"/>	yes <input type="checkbox"/>	no <input type="checkbox"/>	yes <input type="checkbox"/>	no <input type="checkbox"/>	
Pipe-/Vessel No.									
Building									
Product									
Trace heater type									
Lot No. of trace heater									
Trace heater length	<input type="text"/> m	<input type="text"/> m	<input type="text"/> m	<input type="text"/> m	<input type="text"/> m	<input type="text"/> m	<input type="text"/> m	<input type="text"/> m	
Serial No. connection kit									
Serial No. junction box									
Voltage	<input type="text"/> V	<input type="text"/> V	<input type="text"/> V	<input type="text"/> V	<input type="text"/> V	<input type="text"/> V	<input type="text"/> V	<input type="text"/> V	
Current (Switch on / operation)	<input type="text"/> / <input type="text"/> A	<input type="text"/> / <input type="text"/> A	<input type="text"/> / <input type="text"/> A	<input type="text"/> / <input type="text"/> A	<input type="text"/> / <input type="text"/> A	<input type="text"/> / <input type="text"/> A	<input type="text"/> / <input type="text"/> A	<input type="text"/> / <input type="text"/> A	
Output power trace heater	<input type="text"/> W/m	<input type="text"/> W/m	<input type="text"/> W/m	<input type="text"/> W/m	<input type="text"/> W/m	<input type="text"/> W/m	<input type="text"/> W/m	<input type="text"/> W/m	
Trace heater resistance	<input type="text"/> Ω	<input type="text"/> Ω	<input type="text"/> Ω	<input type="text"/> Ω	<input type="text"/> Ω	<input type="text"/> Ω	<input type="text"/> Ω	<input type="text"/> Ω	
Insulation resistance at ..... V	> <input type="text"/> MΩ	> <input type="text"/> MΩ	> <input type="text"/> MΩ	> <input type="text"/> MΩ	> <input type="text"/> MΩ	> <input type="text"/> MΩ	> <input type="text"/> MΩ	> <input type="text"/> MΩ	
Temperature settings	°C	yes	no	°C	yes	no	°C	yes	no
Controller	<input type="text"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="text"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="text"/>	<input type="checkbox"/>	<input type="checkbox"/>
Limiter	<input type="text"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="text"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="text"/>	<input type="checkbox"/>	<input type="checkbox"/>
Low temperature	<input type="text"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="text"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="text"/>	<input type="checkbox"/>	<input type="checkbox"/>

Remarks: \_\_\_\_\_

City/Date \_\_\_\_\_

BARTEC Contractor  
Name / Signature \_\_\_\_\_

Customer  
Name / Signature \_\_\_\_\_

**NOTICE**

Claims under warranty will not be considered if the acceptance report is not filled in completely.



## EC Declaration of conformity

EU Konformitätserklärung  
EU Declaration of Conformity  
Déclaration UE de conformité

# BARTEC

Nº 01-5819-7C0001\_C

Wir	We	Nous
<b>BARTEC GmbH</b> Max-Eyth-Straße 16 97980 Bad Mergentheim Germany		
erklären in alleiniger Verantwortung, dass das Produkt	declare under our sole responsibility that the product	attestons sous notre seule responsabilité que le produit
<b>HTSB</b>	<b>HTSB</b>	<b>HTSB</b>

07-5819-\*\*\*2

auf das sich diese Erklärung bezieht den Anforderungen der folgenden <b>Richtlinien (RL)</b> entspricht	to which this declaration relates is in accordance with the provision of the following <b>directives (D)</b>	se référant à cette attestation correspond aux dispositions des <b>directives (D)</b> suivantes
<b>ATEX-Richtlinie 2014/34/EU</b>	<b>ATEX-Directive 2014/34/EU</b>	<b>Directive ATEX 2014/34/UE</b>
und mit folgenden Normen oder normativen Dokumenten übereinstimmt	and is in conformity with the following standards or other normative documents	et est conforme aux normes ou documents normatifs ci-dessous

**EN 60079-0:2012 + A11:2013**  
**EN 60079-31:2014**

**EN 60079-30-1:2007**


Verfahren der EU-Baumusterprüfung / Benannte Stelle	Procedure of EU-Type Examination / Notified Body	Procédure d'examen UE de type / Organisme Notifié
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**SIRA 10 ATEX 3268**

**0518, SIRA CERTIFICATION SERVICE, Chester, UK**

## CE 0044

Bad Mergentheim, 02.05.2019

  
i.V. Tobias Dold  
Head of Product Management  
EHT



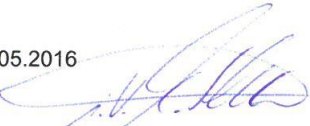
  
i.V. Cristian Olareanu  
Team Leader Certification Center

Konformitätsbescheinigung  
Attestation of Conformity  
Attestation de conformité

**BARTEC**

BARTEC GmbH  
Max-Eyth-Straße 16  
97980 Bad Mergentheim  
Germany

N° 21-1680-7C0001\_C

Wir	We	Nous
<b>BARTEC GmbH,</b>		
erklären in alleiniger Verantwortung, dass das Produkt	declare under our sole responsibility that the product	attestons sous notre seule responsabilité que le produit
<b>PSB Heizsystem</b>	<b>PSB Heating system</b>	<b>PSB système de chauffage</b>
<b>Typ 27-1680-***0/****</b>		
auf das sich diese Erklärung bezieht den Anforderungen der folgenden <b>Richtlinien (RL)</b> entspricht	to which this declaration relates is in accordance with the provision of the following <b>directives (D)</b>	se référant à cette attestation correspond aux dispositions des <b>directives (D)</b> suivantes
<b>ATEX-Richtlinie 2014/34/EU</b> <b>RoHS-Richtlinie 2011/65/EU</b>	<b>ATEX-Directive 2014/34/EU</b> <b>RoHS-Directive 2011/65/EU</b>	<b>Directive-ATEX 2014/34/UE</b> <b>RoHS-Directive 2011/65/UE</b>
und mit folgenden Normen oder normativen Dokumenten übereinstimmt	and is in conformity with the following standards or other normative documents	et est conforme aux normes ou documents normatifs ci-dessous
<b>EN 60079-0:2012+A11:2013</b> <b>EN 60079-7:2007</b> <b>EN 60079-31:2014</b>	<b>EN 60079-30-1:2007</b> <b>EN 62395-1:2006</b>	
<b>Kennzeichnung</b>	<b>Marking</b>	<b>Marquage</b>
 <b>II 2G Ex e IIC T5, T6 Gb</b> <b>II 2D Ex tb IIIC T95°C, T80°C Db</b>		
<b>Verfahren der EU-Baumusterprüfung / Benannte Stelle</b>	<b>Procedure of EU-Type Examination / Notified Body</b>	<b>Procédure d'examen UE de type / Organisme Notifié</b>
<b>KEMA 08 ATEX 0111 X</b>		
<b>0344, DEKRA Certification B.V., Meander 1051, 6825 MJ Arnhem, NL</b>		
<b>CE 0044</b>		
Bad Mergentheim, den 10.05.2016		
 i.V. Tobias Dold Leiter PM EHT	 i.V. Michael Schulte Leiter GW PZ	






Konformitätsbescheinigung  
Attestation of Conformity  
Attestation de conformité

# BARTEC

BARTEC GmbH  
Max-Eyth-Straße 16  
97980 Bad Mergentheim  
Germany

N° 21-1780-7C0001\_C



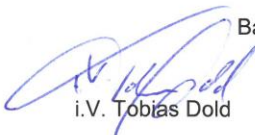

Wir	We	Nous
<b>BARTEC GmbH,</b>		
erklären in alleiniger Verantwortung, dass das Produkt	declare under our sole responsibility that the product	attestons sous notre seule responsabilité que le produit
<b>HSB Heizsystem</b>	<b>HSB Heating system</b>	<b>HSB système de chauffage</b>
<b>Typ 27-1780-***0/****</b>		
auf das sich diese Erklärung bezieht den Anforderungen der folgenden <b>Richtlinien (RL)</b> entspricht	to which this declaration relates is in accordance with the provision of the following <b>directives (D)</b>	se référant à cette attestation correspond aux dispositions des <b>directives (D)</b> suivantes
<b>ATEX-Richtlinie 2014/34/EU</b> <b>RoHS-Richtlinie 2011/65/EU</b>	<b>ATEX-Directive 2014/34/EU</b> <b>RoHS-Directive 2011/65/EU</b>	<b>Directive-ATEX 2014/34/UE</b> <b>RoHS-Directive 2011/65/UE</b>
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<b>Kennzeichnung</b>	<b>Marking</b>	<b>Marquage</b>
	II 2G Ex e IIC 200°C (T2), T3, T4 Gb II 2D Ex tb IIIC T200°C, T195°C, T130°C Db	
<b>Verfahren der EU-Baumusterprüfung / Benannte Stelle</b>	<b>Procedure of EU-Type Examination / Notified Body</b>	<b>Procédure d'examen UE de type / Organisme Notifié</b>
<b>KEMA 08 ATEX 0110 X</b> <b>0344, DEKRA Certification B.V., Meander 1051, 6825 MJ Arnhem, NL</b>		
<b>CE 0044</b>		
Bad Mergentheim, den 10.05.2016		
 i.V. Tobias Dold Leiter PM EHT		 i.V. Michael Schulte Leiter GW PZ

Konformitätsbescheinigung  
Attestation of Conformity  
Attestation de conformité

**BARTEC**

BARTEC GmbH  
Max-Eyth-Straße 16  
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Germany

N° 21-1980-7D0001\_B

Wir	We	Nous
<b>BARTEC GmbH,</b>		
erklären in alleiniger Verantwortung, dass das Produkt	declare under our sole responsibility that the product	attestons sous notre seule responsabilité que le produit
<b>MSB Heizsystem</b>	<b>MSB Heating system</b>	<b>MSB système de chauffage</b>
<b>Typ 27-1980-1**0/****</b>		
auf das sich diese Erklärung bezieht den Anforderungen der folgenden <b>Richtlinien (RL)</b> entspricht	to which this declaration relates is in accordance with the provision of the following <b>directives (D)</b>	se référant à cette attestation correspond aux dispositions des <b>directives (D)</b> suivantes
<b>ATEX-Richtlinie 2014/34/EU</b> <b>RoHS-Richtlinie 2011/65/EU</b>	<b>ATEX-Directive 2014/34/EU</b> <b>RoHS-Directive 2011/65/EU</b>	<b>Directive-ATEX 2014/34/UE</b> <b>RoHS-Directive 2011/65/UE</b>
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<b>Kennzeichnung</b>	<b>Marking</b>	<b>Marquage</b>
 <b>II 2G Ex e IIC 150°C (T3), T4 Gb</b> <b>II 2D Ex tb IIIC T150°C, T130°C Db</b>		
<b>Verfahren der EU-Baumusterprüfung / Benannte Stelle</b>	<b>Procedure of EU-Type Examination / Notified Body</b>	<b>Procédure d'examen UE de type / Organisme Notifié</b>
<b>KEMA 08 ATEX 0110 X</b> <b>0344, DEKRA Certification B.V., Meander 1051, 6825 MJ Arnhem, NL</b>  <b>0044</b>		
Bad Mergentheim, den 10.05.2016		
 i.V. Tobias Dold Leiter PM EHT	 i.V. Michael Schulte Leiter GW PZ	

## Limited Product warranty

### Scope

BARTEC warrants that all BARTEC products and accessories that are the subject of this manual will be free from defects in materials and workmanship from and after its date of purchase for a period of 12 (twelve) months.

This limited product warranty does not cover any damage caused by:

- accidents,
- misuse, improper installation, operation, maintenance or repairs,
- neglect, or
- alteration.

Furthermore BARTEC cannot be held liable under this warranty for:

- installation or removal costs,
- loss or damage to property,
- indirect, special, incidental or consequential damages (including, without limitation, loss of revenue or anticipated profits), or
- any other damages or costs directly or indirectly related to the warranty issue.

If all warranty conditions are met (as set forth below), BARTEC will, at its sole discretion:

- repair the product,
- replace the product, or
- refund the purchase price paid for the product.

This warranty gives you specific legal rights, and you may also have other rights which vary by country, state or province. Except as specifically provided otherwise in this limited product warranty, the BARTEC Group General Terms and Conditions shall apply.

### General terms and conditions

BARTEC Global Terms and Conditions are available at: <https://www.bartec.de/en/terms/>

### Conditions

The limited product warranty is subject to the following conditions:

- proper installation, operation and maintenance in compliance with the state of the technology and the product documentation, and
- presence of completely filled in acceptance reports for all installation, maintenance and repairwork operations.

### How to claim the warranty

To file a claim under the limited product warranty:

- Notify BARTEC or your local BARTEC representative by written correspondence or email within 30 days after identification of a possible warranty issue.
- If requested, you must provide any warranty-related information and documentation to BARTEC, including, without limitation:
  - project planning documents, and
  - acceptance reports for installation, operation, maintenance or repairwork.







**BARTEC REGIONAL OFFICES****BARTEC GERMANY**

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**BARTEC MIDDLE EAST**

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